SCIENTIFIC AMERICAN

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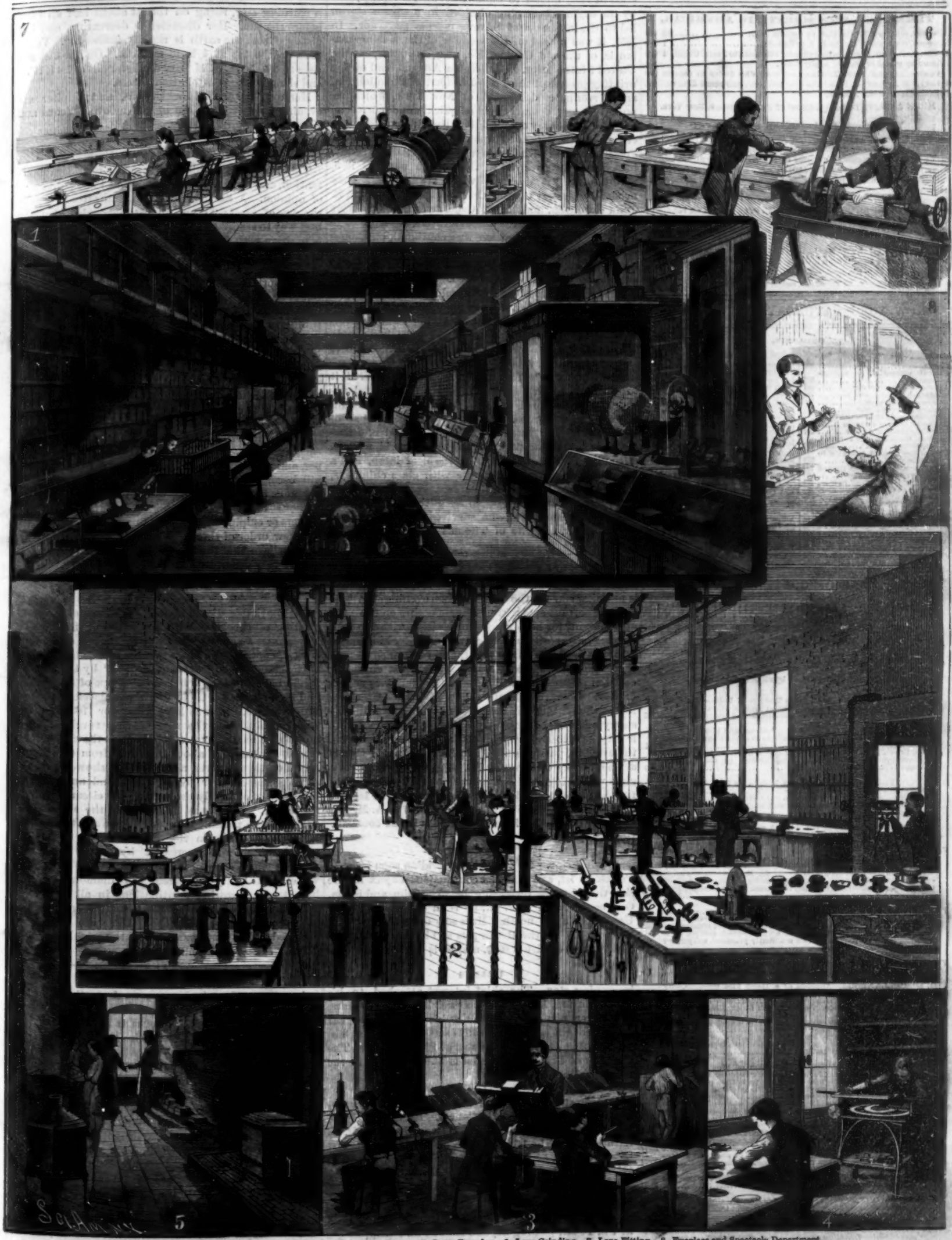

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MANUFACTURE OF SCIENTIFIC APPARATUS—FACTORY, STORES, AND OFFICES OF J. W. QUEEN & CO.—[See page 258.]

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NEW YORK, SATURDAY, APRIL 28, 1888.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 648,

For the Week Ending April 28, 1888.

Price 10 cents. For sale by all newsdealers.

THOMAS SILVER.

Thomas Silver, civil engineer and inventor, died in New York, April 12, of Bright's disease. He was born June 17, 1813, in Cumberland County, New Jersey, of American parents, belonging to the "Society of Friends." When a boy, he developed mechanical ingenuity, and at the age of nine years his little boat, with hidden propeller wheel and other devices, was the wonder of the country village. Models of his many subsequent inventions are at the Patent Office, Washington, Kensington Museum, London, and the Conservatoire des Arts, Paris. The loss of the San Francisco in 1854, bound to California, with troops, caused by the engines becoming disabled in a severe storm, led to the invention of Silver's marine governor. In 1855, it was placed on the engines of the steamer Atlantic, of the old Collins line, also on engines at the United States Mint, Philadelphia Arsenal, and on the printing presses of the *Public Ledger*, of Philadelphia, and *Tribune* and *Herald*, of New York, which reported it as "operating more quickly and correctly, even for stationary engines, than the old two-ball governor, which depended upon gravity." Mr. Silver's greatest success with it was in Europe. Admiral Pairs introduced the governor in the French navy in 1855, maintaining "it was just what always had been needed." Vessels on the Continent soon adopted it. John Hamilton, and, later, Osborne & Co., engineers on the Clyde, became the manufacturers, realizing large fortunes, though opposition was continual, one house in Glasgow confessing candidly as a reason for not using it that they realized $25,000 yearly by repairing engines on which it was not used.

At the Royal Institute, of London, it was resolved that "Mr. Silver had done as much as any man living to facilitate steam navigation, enabling steam vessels to weather all gales, without danger of broken shafts, wrecking, and consequent loss of life." Prince Albert said: "Mr. Silver, it is too common sense a thing, engineers *must* use it." The British Admiralty ordered it into general use in 1864, and so did all the naval authorities of the world, excepting that of his own country, the United States. Mr. Silver was a member of the Franklin Institute, of Philadelphia, and of different societies in Europe, and awarded several medals. His latest inventions were a mechanical lamp, and a lamp burner made to dispense with glass chimneys, which is a great economical success.

Mr. Silver married the daughter of the late James M. Bird, of Philadelphia, who survives him, and leaves one daughter, the wife of Thomas Chalmers, of New York.

POSITION OF THE PLANETS FOR MAY.

JUPITER

is morning star till the 21st, and then evening star. The most important epoch in his course occurs on the 21st, at midnight, for he is then in opposition with the sun. Jupiter in opposition, rising at sunset, looking down from the meridian at midnight, and enthroned among the bright stars of Scorpio, makes the most charming celestial picture that will glow on the planetary annals of May. Observers should follow his course as rising low in the southeast earlier every evening he leads the starry hosts as they move over the heavenly road. He is very near to Beta Scorpii on the 20th, at 10 o'clock in the evening, passing only 2′ south of the star, scarcely a line of sky intervening between them. An opera-glass will bring star and planet into the same field at the time of conjunction. Jupiter rises on the 1st at 8 h. 38 m. P. M. On the 31st he sets at 3 h. 57 m. A. M. His diameter on the 1st is 42″.4, and he is in the constellation Scorpio.

MARS

is evening star. He is on the meridian soon after 10 o'clock on 1st, and is still a conspicuous object in the sky, the distance increasing between him and Spica. On the 5th, at 1 h. P. M., he is in conjunction with Uranus, being 35′ north. Mars sets on the 1st at 3 h. 54 m. A. M. On the 31st he sets at 1 h. 45 m. A. M. His diameter on the 1st is 16″.2, and he is in the constellation Virgo.

URANUS

is evening star. The chief interest attached to his course during May is his near neighborhood to Mars, the larger planet serving as a guide to point out the position of the smaller. Uranus sets on the 1st at 3 h. 49 m. A. M. On the 31st he sets at 1 h. 50 m. A. M. The diameter of Uranus on the 1st is 3″.8, and he is in the constellation Virgo.

SATURN

is evening star. He is moving eastward and approaching the cluster Præsepe, in Cancer. He is on the meridian, or point overhead, on the 1st, at 5 h. 31 m. P. M. Saturn sets on the 1st at 12 h. 45 m. A. M. On the 31st he sets at 10 h. 54 m. P. M. His diameter on the 1st is 17″, and he is in the constellation Cancer.

MERCURY

is morning star till the 10th, and then evening star. He reaches superior conjunction with the sun on the 10th, at 7 h. P. M., passing beyond the sun and reappearing on his eastern side as evening star. Mercury rises on the 1st at 4 h. 35 m. A. M. On the 31st he sets at 9 h. 4 m. P. M. His diameter on the 1st is 5″.2, and he is in the constellation Aries.

NEPTUNE

is evening star until the 20th, and then morning star. He is in conjunction with the sun on the 20th, at 8 h. A. M., changing his position to the sun's western side and becoming morning star. He is in conjunction with Mercury on the 15th, both planets being very near the sun. Neptune sets on the 1st at 8 h. 15 m. P. M. On the 31st he rises at 3 h. 58 m. A. M. His diameter on the 1st is 2″.4, and he is in the constellation Taurus.

VENUS

is morning star, rising on the 1st about half an hour before the sun. Her diameter is decreasing, and her distance from the earth is rapidly increasing. Venus rises on the 1st at 4 h. 13 m. A. M. On the 31st she rises at 3 h. 54 m. A. M. Her diameter on the 1st is 10″.6, and she is in the constellation Pisces.

Mercury, Saturn, Mars, Uranus, and Jupiter are evening stars at the close of the month. Venus and Neptune are morning stars.

The Sharing of Profits with Employes.

This is a subject which is receiving considerable attention, and one on which there seems to be a diversity of opinion. A Springfield (O.) manufacturer says in the *Age of Steel*: "I am almost persuaded that the best way to secure the undivided interest of an employe is to share with him the profits of the concern. You thus make him your partner; he is elevated in his own estimation and in reality; he feels a certain pride in the work turned out, not only of his department, but of the entire factory; he has aroused in him a feeling that he is in a certain sense responsible for anything that may go wrong about the establishment, and he will use his best mental and physical endeavors to do the particular piece of work he is doing as well as it can possibly be done. I believe, also, that the system of profit sharing is a solution of the labor question. The system brings employer and employe together. They are friends, colaborers, in a common cause. What is for the best interest of the one is for the best interest of the other, and should any difference arise between them they will not go into a corner and sulk and nurse their grievances until a molehill becomes a mountain, but will come together like partners, as they are, and will adjust their differences without trouble. I am not saying that either employers or employes in this country are yet ready for this new order of things. But they will grow into it, for I believe that the time will come when the system will be very generally adopted in this country."

An Unpolishable Diamond.

A remarkable diamond was exhibited at a recent meeting of the New York Academy of Sciences by Mr. George F. Kuntz. It was a compound or multiple crystal, containing a large number of twinnings. It is of the class termed "extreme durate" by the French. It had been cut into the general shape of a brilliant, and its main face or table was then placed on the polishing wheel. It was kept there for 100 days, the wheel revolving at the rate of 2,800 revolutions per minute. The diamond was held upon the rotating surface at a distance of about 15 inches from the center. Based on these figures, a calculation showed that the surface passed over by the diamond amounted to 75,000 miles, or nearly three times the circumference of the earth. Yet it was all futile, as the stone would not acquire a polish. The ordinary weight placed on a diamond, while on the wheel, is from 2¼ to 2½ pounds. This was increased by 4 and 8 pounds without effect, and finally 40 pounds were used. The wheel was badly damaged, the diamond plowing into it and throwing scintillations in all directions. The diamond, even under these conditions, could not be given a commercial polish. The wheel had to be replaced. The work was done in the establishment of Tiffany & Co., of this city.

Exploration of Greenland.

A correspondent in Norway sends us the following interesting information:

The conservator of the museum at Bergen, Mr. Frithjof Nansen, intends very soon to investigate the interior of Greenland.

One of our sealers is to take him to the eastern shore, where he is to land at, or near, Scoresby Sound.

Taking the place as a starting point, he intends to cross the continent to some place near Disco Island, on the western shore. For making the journey over the ice or snow he means wholly to rely on the use of the Norwegian snow shoes, long narrow strips of wood (ash as a rule), on which great distances can be traversed in an incredibly short space of time.

Mr. Nansen is a man of learning, of an energetic turn of mind, and is bent upon seeing his plan accomplished in this manner. He is an expert on snow shoes, and is to be accompanied by only three or four other persons accustomed to the hardships of mountain traveling in a Norwegian winter, as is also Mr. Nansen himself.

Military Notes.

With the increase of her army and navy, the war fever in Italy seems to be growing apace. The Alpine frontier is being strengthened with something like feverish haste, owing, no doubt, to the preparations on the French side, and the Italian military journals are filled with so-called proofs that war is imminent. *Escrito Italiano*, in a recent issue, declared that it had discovered a French conspiracy to fall suddenly upon Spezia with ships and troops and simultaneously with a declaration of war. It warned the government that a *coup de main* was about to be made, and insisted that the Italian fleet recently collected at Madalena should be instantly dispatched to the threatened port. *L'Avenir Militaire*, speaking at great length on the subject, explains how so absurd an idea got abroad.

It says that Capt. Mirabello, Italian naval *attache* to the Paris legation, became alarmed by the unusual naval preparations he saw making at Toulon, where the French Admiral Krauz is refitting a big fleet recently arrived from Tonkin, consisting of some forty ships of the line; and because the Admiral, whom he interviewed at the Ministry of Marine, was unwilling to unfold his plans, the over-excited Italian jumped to the conclusion that a descent upon the big Italian naval *entrepot* was contemplated, and sounded the alarm. The affair is what we would call a tempest in a teapot, and seems, at least from this distance, scarce worthy serious attention.

Our English contemporary *Broad Arrow* does not think so, however. It says:

"What redress has the government of France against the *Escrito* if the story told by that Italian journal is not true? What a picture of national demoralization if it is true! What an abominable libel if it is false!

"If France really had any such ideas, the mere entertainment of them goes far to place her outside the pale of the civilized society of nations; for such things are not war, they are gigantic acts of piracy. If France cannot clear herself of the charge, let her be Anathema maranatha, and let us in England sit tight and take care that no laxity shall suggest a temptation to a people unable to resist it. Yet can we not believe the story is true."

Sir Edward Reed, the famous naval architect, but no longer having a hand in English naval construction, says that none of the big ships built for the royal navy, since he was at the head of the construction department, are reliable for war purposes, that they look formidable and seaworthy, and so they are in time of peace, but the very moment anything useful and practical shall be expected of them, he says, is when they will be found most deficient and unreliable. Curiously enough the present Board of Naval Constructors have decided that the ships he built are obsolete, and this would make it appear—if we take the opinions of both sides—that Britain has no effective ships at the present time. During a recent naval debate in the House of Commons Mr. Reed said: "Nine millions [$45,000,000] have been spent on ships which, if they entered battle, would be lost almost as readily as if they had no armor, and would be only saved by their engines and boilers," that is, by running away. There is food for reflection in this!

Apropos of this, we have the recent payment of $15,000 to an English naval architect, Mr. Johns, by our navy department for a design of a big armored ship embodying the same ideas of construction which are thus pronounced fallacious, and which it seems no exaggeration to say have been fairly shown so to be, by the recent naval maneuvers.

The German military authorities are much troubled over the question of magazine rifles *vs.* single firers, for the latter, it is conceded, has some decided advantages over the new arm. The *Militar Wochenblatt*, commenting upon the recent report of the Russian General Wasmund to the Russian military authorities, admits there is at least some sound reasoning in his findings. General Wasmund, who is recently returned from an extended examination of the magazine gun as now used in the Continental armies, declares he discovered no proof whatever of its superiority. On the contrary, where trials were made of the two arms simultaneously, and under similar conditions, he observed that the very reliance which the multi-firer bred in the soldier was a source of weakness at the critical moment. Looking to the many charges in his gun to stand him in stead, he neglected to take those precautions which are necessary while using a piece that must be reloaded after each fire, and fired too quick and without proper aim. Especially after long marching was the inferiority of the new arm observable; those armed with the old one hitting the mark oftener because of the less weight to bring to the shoulder and the unchanging poise. Russia will not change—at least for the present.

The Germans have given up the metal breast and back plate or cuirass. It is found to offer little protection, unable to stop a bullet, besides rendering gunshot wounds more dangerous because of the pieces of metal torn from it by the bullet and often forced into the wound.

Roscoe Conkling.

On the morning of Wednesday, April 18, Roscoe Conkling died. His death is attributed largely to his exertions during the March storm, when in the height of the gale he walked up town from his office in Wall Street. He died at the height of his career as politician and lawyer. As legislator he had made for himself a unique fame. Positions that other men work for he was able to resign, or to refuse when offered.

He was born in Albany, N.Y., in 1829. His father was Alfred Conkling, a lawyer of considerable reputation, a circuit judge in 1825, and minister to Mexico in 1852. Roscoe Conkling was one of three sons, of whom Frederick A. is still living. Without graduating at any college he began the study of the law, entering the law office of Spencer & Kernan, of Utica, N. Y., in 1846. In 1858 he was elected mayor of Utica, which office he resigned a year later.

His services in the national legislature began in 1859, when he entered Congress as a representative of the Oneida district. With one intermission he held a position in the House of Representatives for a number of years. In April, 1866, upon a bill relating to the reorganization of the Army of the Potomac, he and Mr. James G. Blaine were opposed to each other. The debate became acrimonious, and was the foundation of a quarrel that has been termed historic. In January, 1867, he took his seat in the United States Senate, having to resign a seat in the House of Representatives to accept the promotion. In May, 1881, during President Garfield's incumbency, he resigned from the Senate, and thenceforward devoted himself to the practice of law. It is said that the purpose of his resignation was to obtain a unanimous vote for a return, and thus to vindicate his position in certain political differences with the executive. It resembled the English appeal to the country. He was not re-elected, and passed out of public life. In 1882 President Arthur sent in his name to the Senate for a position on the bench of the United States Supreme Court, but Mr. Conkling declined the honor.

His work as a lawyer since that period has been of immense importance and extent. He acted as counsel for many corporations, and had acquired a very high reputation in the more important class of patent cases. He was married to a sister of Horatio Seymour, and she, with an only child, a daughter, survives him. In 1877 he received the degree of LL.D. from Madison University.

Dr. Cornelius Rea Agnew.

This eminent specialist, famed for his skill in the treatment of affections of the eye and ear, died on Wednesday, April 18. On Sunday, April 8, he was attacked by peritonitis. He had been called in to treat Mr. Conkling, who was attacked by his last illness on April 5. Dr. Agnew called upon Drs. Sands and Barker to assist in performing the operation, but his own illness forced him to give up the care of his distinguished patient. Six days before his death, he submitted to the operation of laparotomy, administering the ether himself. Pus was discovered and the cavity was drained, but without any effectual relief.

Dr. Agnew was born in this city, August 8, 1830. He graduated from Columbia College in 1849, and from the College of Physicians and Surgeons in 1852. About a year later he was appointed surgeon of the Eye and Ear Infirmary, and then went to Europe to complete his studies. In Dublin, London, and Paris he pursued his researches, and in 1855 returned to America. In 1864 he resigned his position at the Eye and Ear Infirmary on account of his other pressing duties. He was one of the founders of the Union League Club, a leading member of the U. S. Sanitary Commission, the founder of the Ophthalmic Clinic of the College of Physicians and Surgeons, and he initiated many other important professional movements. He was one of the oldest members of the board of trustees of Columbia College, and was a member of a great number of scientific societies.

John R. G. Hassard.

On Wednesday, April 18, Mr. John Rose Green Hassard, of this city, died. He was born on September 4, 1836, in New York, and graduated from St. John's College, Fordham, in 1855. He adopted literature as his profession, and in it attained considerable eminence. His first important work was done on the "New American Cyclopedia," now "Appleton's Cyclopedia." Here he was in constant association with Mr. Ripley, the chief editor, then also engaged on the *Tribune*, who was greatly impressed by Mr. Hassard's ability. In 1865 Mr. Hassard was editor of the *Catholic World*, and at last, in 1866, became associated with the New York *Tribune*, and continued the connection until his death. He did a great variety of literary work for that and other journals, musical criticism being one of his especially strong points. While on the *Tribune* staff, Mr. Hassard and another member thereof independently attempted to decipher the famous cipher dispatches of the Democratic managers in the Tilden-Hayes campaign. When each had attained a partial success they compared notes, and thenceforward progress was rapid. It is said that he never recovered from the strain that this performance entailed.

Among his works may be cited the following: "Life of Archbishop Hughes" (1866), "Life of Pope Pius IX." (1877), "A History of the United States" (1877), "The Ring of the Nibelungs" (1877), and "A Pickwickian Pilgrimage" (1881).

The San Salvador Railway.

From the harbor of La Union, on the Pacific, the railway crosses the State of Sta. Ana, a district of Salvador 50 miles square, producing, it is stated, more coffee than any equal area of land in the world. In truth, every acre of the *mesa* of Salvador is cultivated, each producing from two to four crops annually. The products are rice, tobacco, indigo, sea island cotton, coffee, sugar, cocoa (chocolate), India rubber, and Peruvian gum—so-called because it was originally sent from Salvador to Peru and thence to European markets. The railway penetrates from La Union to Puerto Barrios or to Port Izabal on the Atlantic side, whichever harbor may be its northern terminus, a very paradise. The average density of population along the whole route exceeds 100 for each square mile. Here villages and towns are almost conterminous, and the population—Aztec 92 per cent and Spanish 8 per cent—toil most industriously. Labor costs 20 to 25 cents and food 10 cents per diem. The thatch-roofed, floorless adobe huts of the natives (Aztecs) are the cheapest possible, and only useful in protecting the occupants against rain storms of July, August, and September (the rainy season), when the country is flooded almost every day. There is not a stove or fireplace in any house in the republic. None is needed where the thermometer never falls below 70 or rises above 80 degrees. So great is the annual production of fruits, as well as of indigo, tobacco, sugar, and coffee, and so short the distance from Port Barrios to Mobile, that it is believed that most delicate and delicious tropical fruits, never seen in the United States, will be distributed everywhere from Mobile; and so redundant are the crops of Salvador and of the districts of Guatemala penetrated by this railway that it must have two tracks—one for immense local, the other for interoceanic, freights and travel.

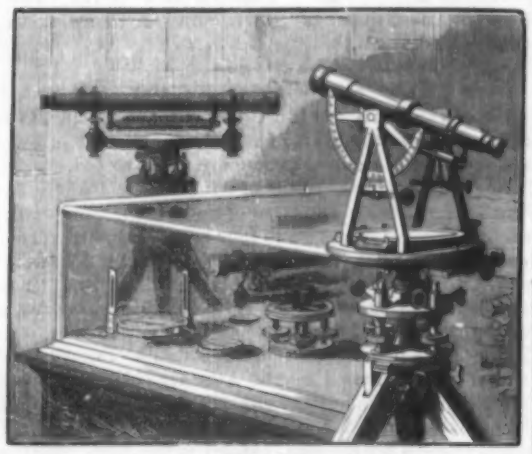
But the great good to be achieved by this transisthmian road consists not so much in the fact that it will enable traveling multitudes to cross the continent where narrowest without possible danger from deadly fevers and plagues incident to detention at the sea level, but, with its branches, binding together these five Central American states in perfect political and social unity, it accomplishes their perfect *commercial* annexation to the United States. Puerto Barrios is within fifty hours or less of Dauphin's Island wharves at Mobile, and only sixty hours would be required to transfer a traveler or bale of goods from Mobile to the Pacific coast harbor of La Union. United States and other steamers now pay from $20 to $30 a ton at La Union for English or Australian coal. It may be delivered there from Alabama over the transisthmian railway for from $5 to $7 a ton. Therefore, the government of the United States, as well as the people, must confess keen interest in this short, easily built railway, which surely must accomplish most beneficent political and commercial results.

After the plan of the transisthmian railway was conceived and the details published, and after applications were made for charters in Salvador and Guatemala, English and French bankers and capitalists sought much the same concessions; but the governments of Salvador and Guatemala both gave preference to the American applicant for these franchises. The Salvador charter conceded a monopoly for fifty years of the right of access to the matchless harbor of La Union. The cost of a double track road from La Union to Port Izabal or Port Barrios, it is stated by engineers who have surveyed part and traversed the whole route of about 300 miles, will not exceed $35,000 a mile. There will not be a tunnel on the whole line, or a grade greater than 70 feet on any mile, and this only at each terminus, whence locomotives must climb, within 30 or 40 miles, to the mesa 2,000 feet above the sea.

The rapid multiplication of foundries, furnaces, and forges in Alabama and other Southern States induced the writer to seek, for the behoof of the commonwealth which is his home, an insatiable market for its products, to be found alone along the western shores of the three Americas. From every trading place of as many as 2,000 or 3,000 inhabitants along this interminable coast a railway will soon lead to farms and villages of the interior. Twelve such railways are now building between the southern confines of Chili and California. If the transisthmian railway be speedily finished, the iron and coal and steel of England and Australia may be supplanted everywhere on the Pacific by that produced in the United States.—*Report of L. J. Du Pre, U. S. Consul, San Salvador.*

THE MANUFACTURE OF SCIENTIFIC APPARATUS.

Thirty-five years ago, Mr. James W. Queen, a gentleman of scientific attainments and great business ability, began in the city of Philadelphia a small business in optical and philosophical apparatus. In 1859 he associated with him Mr. Samuel L. Fox, and under their personal supervision and management the business steadily developed and quickly outstripped similar establishments. In the year 1870 Mr. James W. Queen withdrew, and Mr. S. L. Fox continued and still continues the business under the old title of James W. Queen & Co. Different branches were gradually added until the business became the largest and most comprehensive of its kind in the United States or in the world. The progress and development of this business is, without doubt, a fair index of the scientific progress of this country. In time the business became so large that it was found necessary to arrange the different branches under different departments, with a competent man at the head of each department.



ENGINEERING INSTRUMENTS.

There are at present six departments, arranged under the following heads: Physical and chemical, engineering, ophthalmic, microscopical, the magic lantern department, and the photographic department. The headquarters of these departments are at 924 Chestnut Street, Philadelphia, at the site occupied originally by Mr. Queen; but the business having enormously outgrown the building, some of the departments were obliged to seek quarters for apparatus in other buildings in the vicinity of the main offices of the establishment. The factory in which are made a large proportion of the instruments and apparatus sold by Queen & Co. was long ago removed to more commodious quarters, now occupying a floor extending through a city block and fifty-five feet in width.

Although the importation of fine instruments for demonstration and for commercial use is a large and important part of the business of the concern, the manufacture of such instruments has reached proportions which can hardly be appreciated without a visit to the shops.

One of our illustrations gives a truthful representation of the place wherein are made scientific instruments in such great variety as to render it impossible for us to even enumerate them. We may, however, mention a few of the leading articles. A great deal of work for the government is done in this place. The apparatus for the Signal Service is largely furnished by Queen & Co. One of the features which first attracts the attention of visitors to the shop is a machine for testing anemometers. A pair of anemometers are attached to a long beam, which is rotated at a known velocity. This is, of course, the equivalent of causing the air to pass the anemometers at the same velocity. By means of the rotating beam the instruments are carried through the air at different velocities, ranging from a fraction of a mile per hour up to the velocity of a cyclone, and the instruments are adjusted to accurately indicate and record the velocity.

The thermometers and barometers used by the government are made here. An order from the government for a large number of microscopes of special design for testing certain adulterations of food has recently been completed.

The microscopes of the various "Acme" patterns are made here, these being finished up in lots of from twenty-five to fifty of a kind; many of the parts are made up by hundreds at a time. As the best drawn steel pinions to be found in the market have proved to be of insufficient exactness to make a perfect rack and pinion movement, all the pinions and racks used here in the manufacture of microscopes are cut by fine machinery, specially adapted to this work. To secure perfect smoothness in motion, each rack and pinion is "ground in." The making and adjustment of the rack and pinion is one of the most vital points of a microscope; indeed, it is an art of itself.

Engineering instruments are made here in large quantities. Transits are generally made in lots of 25, levels in lots of about 75. By carrying on the manufacture of instruments in large lots, the quality of the work is not only kept up to a high standard, but the workmen acquire such dexterity as to greatly reduce the cost of labor on these instruments.

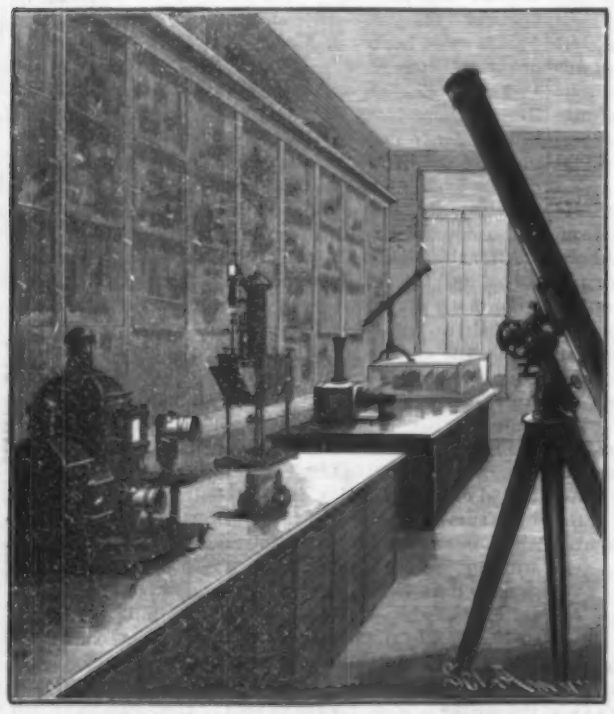
The machinery used in the shops has been purchased, so far as it is possible to purchase machinery adapted to this kind of work, but a large number of special tools and appliances have been made in the shop which are adapted to this particular line of manufacture only.

To secure the quality of brass and bronze castings required in the manufacture of the instruments, it was found necessary to add a brass foundry. Phosphor bronze and aluminum bronze enter largely into the manufacture of many of the engineering and physical instruments.

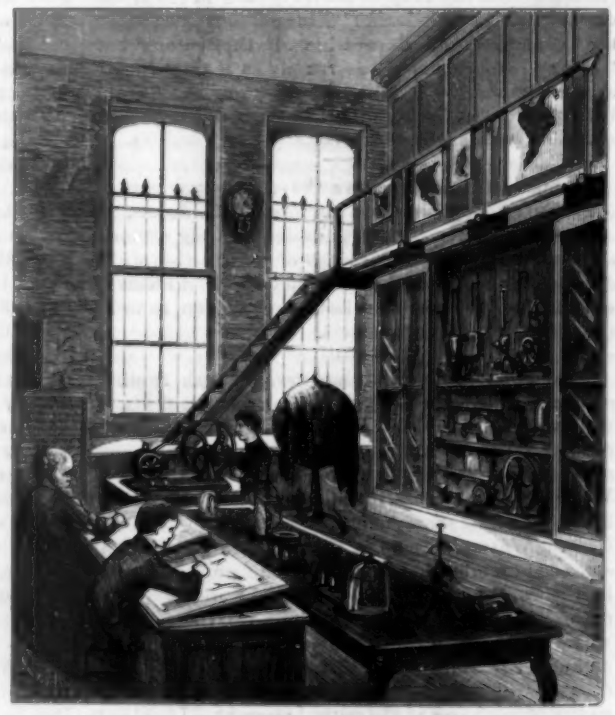
Among the instruments and apparatus being made we will mention air pumps, induction coils, separable induction coils, Holtz machines, gyroscopes, drawing and mathematical instruments, and instruments for electrical measurements. It is a mistake to suppose that all of these instruments are designed only for institutions of learning. A large proportion of them are specially designed for practical, every day use in connection with regular manufactures and electric lighting.

Much of the apparatus is of new and original design. One of the figures of the engraving shows the designing department, in which the drawings are executed for the construction of scientific instruments regularly made in the establishment, as well as for work done to order.

The work done in the designing department covers almost every kind of apparatus for the illustration of the laws of physics and chemistry in their various branches. The designing of such instruments requires not only great mechanical ability, but also a thorough knowledge of the laws which the instruments are intended to illustrate, and must therefore be carried on by men of education and special talent. The manufacture of such special instruments in the workshops also gives to the men employed on such work a faculty for grasping new ideas and carrying them out which is not to be found where the men work in regular lines, making only the specialties to which they are accustomed. The instruments manufactured by this firm from their own designs are greatly varied, covering those for the illustration of the laws of mechanics, hydrostatics, pneumatics, acoustics, optics, heat, electricity, in short, the whole range of physics, as well as much in chemistry. The apparatus sold by this firm is furnished not only to all parts of the United States, but they have constant demand for goods to go to Canada, Mexico, the South American states, China, Corea, Japan, and the Pacific islands. The cause for this may be found in the fact that they are of such general interest, embracing as they do appliances for all the arts and industries, for the physician and specialist, for the laboratory and observatory, for the workshop and the railroad, for the scientific investigator and experimentalist, as well as the mechanic and the farmer.

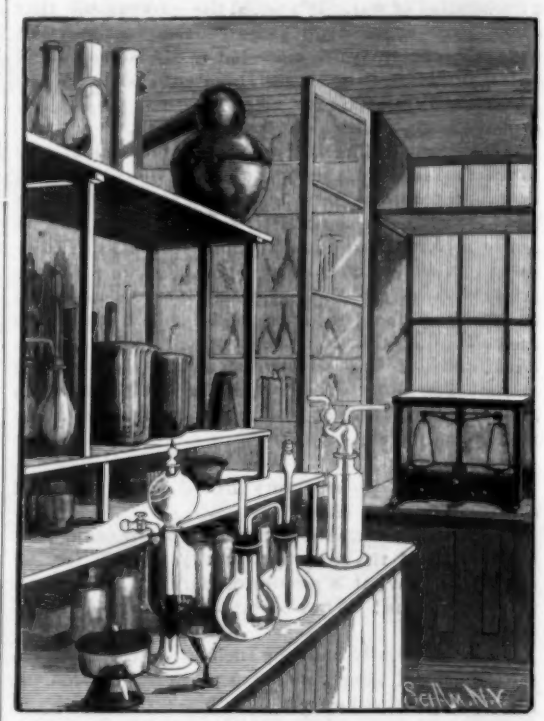


LANTERN AND TELESCOPE DEPARTMENT.



DESIGNING DEPARTMENT.

While all the apparatus might come under the general heads of physics and chemistry, there is a special department (No. 4) devoted to these sciences with their various branches, as exemplified in apparatus for research and for practical use. Under this head comes the department for electrical instruments, galvanometers, bridges, resistance coils, reading telescopes, ammeters, voltmeters, and similar instruments, which include those for the most careful research, as well as for the use of the practical electrician in the dynamo room.



CHEMICAL APPARATUS.

This particular branch of the business has grown to very large proportions within the last few years, and is now very complete.

The sale of ammeters and voltmeters, both for scientific measurements and for practical work, is one of the specialties which has assumed large proportions, and they sell to universities, electric lighting companies, users of batteries, dynamo machines, in short to all of those industries where the ammeter and voltmeter have become as necessary as the steam gauge. It is perhaps well to mention that Queen & Co. are sole agents for the popular and well known Ayrton & Perry instruments for electrical measurements.

Under the head of physics and chemistry is included another department, comprising anatomical and botanical models in plaster of Paris and papier mache. This branch includes a large and fine collection of manikins and models of different physiological subjects from well known European makers. They also include some entirely new and beautiful botanical models. Some of the novelties of this department are the models in gelatine of budding yeast, after Koch, and of other low forms of life, bacilli, etc., which represent the subjects as they appear when magnified 25,000 diameters.

Among the most interesting things in the department of physics are the new forms of polariscopes for

the table and for projection, and the exquisite specimens arranged to be used with these instruments.

The new form of Toepler-Holtz machine made in this establishment deserves more than a passing notice. It generates electricity in all weathers, is always ready for immediate use, and yields torrents of sparks.

In this department we also notice a new air pump, which gives a vacuum of 99¾.

In this department may also be found a large collection of instruments for very accurate measurements. Among these are the standard meters, such as are used at the Bureau of Weights and Measures at Sevres, comparators, dividing engines, cathetometers, micrometers, spherometers, and other instruments of precision of the highest class.

In the chemical department a specialty is made of the importation of balances for all purposes, including very fine analytical balances, some of them sensible to the twentieth of a milligramme. The stock of chemical glassware, pure chemicals for technical work, platinum, etc., is large and complete.

In the department of engineering are found transits for railroad engineers, city work and general surveying, engineers' and architects' levelers, plane tables, surveyors' compasses, leveling rods, chains, and all other instruments required to complete the outfit of the engineer, either for reconnaissance or for the final work of laying out the line of a railway or boring a tunnel. We are informed that these instruments are sent to every part of the world. In this department are also made the elaborate and costly instruments of precision used principally by the United States government, such as standard comparators for the testing room in the United States Signal Service, standard ruling and engraving machines for the United States hydrographic office, the instruments of precision for the engineer corps, etc. The firm, besides being large manufacturers of engineering and drawing instruments, are large importers of these articles, as well as the stationery and other materials required by draughtsmen and engineers.

The ophthalmic department, which is known as department No. 1, embraces all the apparatus and appliances used for the examination of the eye, and includes spectacles, eye glasses, opera glasses, etc. It is one of the largest branches of the business. The lens-grinding room, a part of which is shown in one of the engravings, is devoted almost exclusively to making what are known as "prescription glasses," which are required to be ground specially to order. This department is particularly interesting, as here the process of making lenses can be traced from beginning to end. The number of prescriptions which come in daily through the mails and otherwise from all parts of the country indicates the importance of this branch of the business. It is surprising to note the variety of defects in the eye which are corrected by special glasses. These prescriptions are prepared from measurements. The old way of fitting the eye by trial is now almost discarded. In this department are made ophthalmoscopes, by means of which the interior of the eye is illuminated and examined by the physician. In this department are also made other ophthalmological apparatus, such as perimeters, trial frames, test cases, prisms, etc.

In the department known as No. 5 may be found astronomical instruments and apparatus for projection. The astronomical branch comprises refracting and reflecting telescopes, the stands and other accessories required for practical observation; microscopes, helioscopes, spectrum attachments, eye pieces, etc., transits, sidereal clocks and chronographs, which are particularly designed for schools and colleges. In the branch devoted to projection there are various forms of lanterns, which are known under the names of sciopticons, stereopticons, college lanterns, for entertainment as well as for instruction. Some of these lanterns are provided with powerful petroleum lamps of new design, which compare favorably with other illuminators. As might be expected in an establishment like this, a large stock of pictures for use with the lanterns, embracing educational views, diagrams, and pictures of various physical apparatus, are kept on hand.

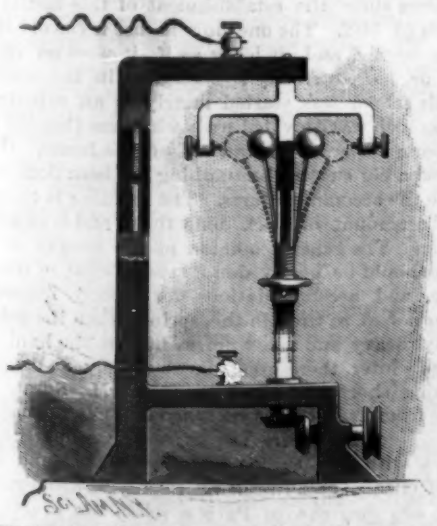
The photographic department, although a comparatively new one, shows all the spirit and enterprise which characterizes this establishment, having within five years introduced many articles of value to photographers, the most important of which are the well known Queen-Francais photographic lenses, indorsed by the highest authorities, and the Queen pantagraph lenses, which are designed to supply a lens of good quality at a reasonable price.

This department has also commenced the publication of a magazine entitled "Science of Photography," which is full of interest and covers a wide range of subjects.

It is impossible to fitly describe in detail all the departments of a great establishment like this. Each department is a little world in itself, covering many branches, each of which in turn includes many subbranches, so that it would require volumes to adequately describe everything that may be seen at the store and wareroom.

Any one desiring further information than we have been able to give, can readily obtain it by securing one or more of the large number of catalogues published by this house, relative to the different departments.

The firm, in addition to the catalogues of their own productions, make a specialty of securing catalogues of all foreign makers of apparatus in different branches of science, and of keeping informed as to the scientific and practical knowledge and apparatus of the day, so that they may properly be considered a bureau of information for those who choose to avail themselves of its advantages.



SCHLEPEGRELL'S ELECTRICAL SPEED INDICATOR.

AN IMPROVED HORSESHOE.

A horseshoe which is designed to combine the advantages of a smooth or a flat calk shoe and a sharp calk shoe has been patented by Mr. Israel G. Howell, of Hopewell, N. J., and is illustrated herewith. The shoe proper, or main shoe, to be attached with nails in the usual way to the horse's hoof, is shown in Fig. 2, a supplemental or over shoe being shown in Fig. 3, and being adapted to be attached to and detached from the main shoe. The supplemental shoe has on its inner side flat surfaces corresponding with the flat surfaces of the main shoe, and it has recesses, one in its forward end and one at each of its rear ends, corresponding with the wedge-shaped and dovetailed toe calk and the heel calks of the main shoe. The supplemental shoe has sharp or pointed calks on its bottom, and is adapted to be secured to the main shoe by screws passed through suitable screw holes provided therefor. By this invention a shoe having one or the other forms of calks may be readily fitted without the necessity of withdrawing nails from the hoof and renailing, and the changing may be performed by unskilled persons.

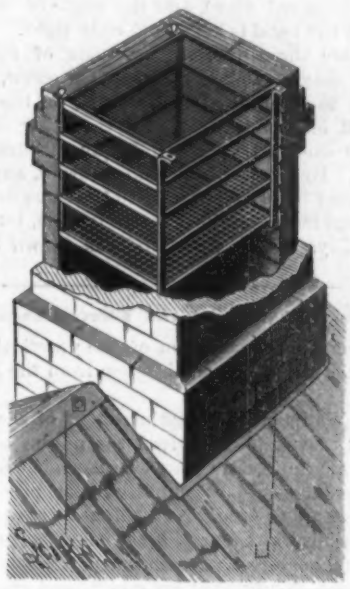
HOWELL'S HORSESHOE.

AN IMPROVED ELECTRICAL SPEED INDICATOR.

A simple device by which the increase or diminution of speed in machinery above or below its normal rate may be indicated electrically, is illustrated herewith, and has been patented by Mr. Frederick W. Schlepegrell, of No. 20 Ashton Street, Charleston, S. C. The indicator shaft, arranged to receive motion conveniently from the machine whose speed is to be indicated, is formed of two parts connected together by an insulating sleeve, and is journaled in a frame whose upper and lower parts are also connected by a threaded insulating sleeve, binding posts, connected with an electric bell or alarm, being secured to the lower and upper parts of the frame. In grooves on opposite sides of the indicator shaft are secured flat springs, with a weight, preferably of spherical form, on the outer extremity of each spring, a nut being fitted to move up or down on the shaft to vary the length of the free ends of the spring arms. The weights are adjusted relative to the motion of the indicator shaft when driven by a machine, so that when the machine runs at its normal speed the weights will revolve in a position between the upper part of the shaft and the contact screws on either side, the variation in the throw of the spring arms being indicated by the dotted lines. When the speed of the machine increases so that the weights touch the contact screws, the circuit is completed and an alarm is given, a like effect being also produced when the machine runs slower than its normal speed, or when it stops, as the weights are then brought into contact with the upper part of the indicator shaft, thus completing the circuit. The indicator may be adjusted to adapt it to higher or lower speeds by turning the nut on the lower portion of the indicator shaft, thus shortening or lengthening the spring arms, and also by turning the contact screws in or out.

AN IMPROVED SPARK ARRESTER.

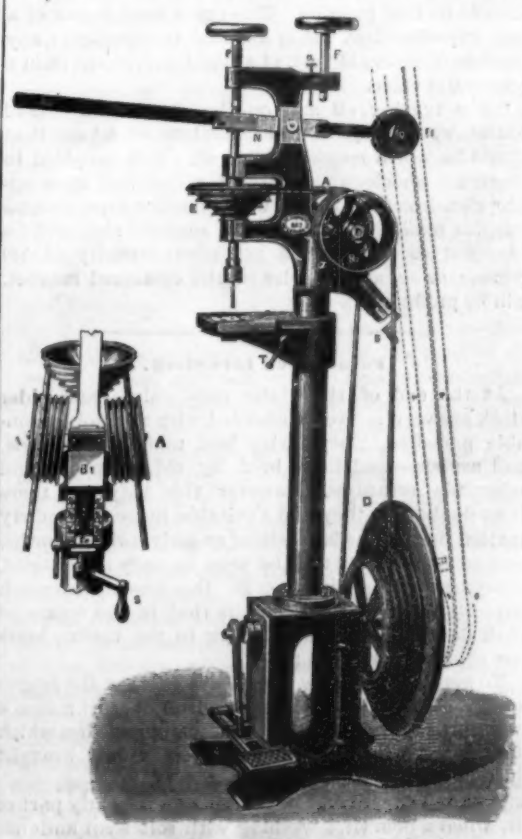
A device adapted for application to chimneys, stove pipes, and smoke stacks, to prevent sparks and cinders from passing out, and whereby they will be thrown downward to the base of the chimney, is illustrated herewith, and has been patented by Messrs. Frederick Bruhn and Jerome Raum, of Fort Shaw, Montana Ter. Two or more, but preferably five, frames are made of double strap iron, of a size equal to the inner dimensions of the chimney stack or pipe, and across the top of each frame wire netting is stretched, the ends of the netting being carried down in a space between the opposing members of the frame. The screens are made of very thin wire, the meshes of one screen being very fine and the meshes of the others increasing in size, the screens being retained in horizontal position one above the other, about four inches apart, by their attachment at each corner to vertical rods. With this arrangement any sparks or cinders passing through the bottom screen are checked at the upper one and deflected downward to the base of the chimney. In placing the series of screens in a chimney they are manipulated by means of knobs on the vertical rods, and are supported by projections from the rods resting on the top of the chimney. This spark arrester can be readily taken apart and put up in a very small space for shipment, and can be manufactured very economically.



BRUHN & RAUM'S SPARK ARRESTER.

IMPROVED DRILLING MACHINE.

We illustrate a handy drilling machine, capable of being driven either by foot or power, which we find in *Engineering*. The driving band runs from a large cone



HIGH SPEED DRILLING MACHINE.

pulley, D, on the main shaft round a pair of guide pulleys, A, to a cone pulley, E, on the drill spindle. The arrangement of the guide pulleys is novel. They are mounted on an inclined slide, along which they can be moved by a screw, and they are so arranged on this slide that as they move lengthwise they are tilted sideways, so as always to present a fair lead to and from the particular step of the main pulley which they may be opposite. Each guide pulley has five grooves, corresponding to the five steps of the cone on the drill spindle (see detached view), and the angle of the slide is such that the band is kept uniformly tight.

There are three different methods of feeding the drill. It may be forced down by the screw, P, or by applying the hand to the lever, N, or the counterweight, B, may be transferred to the other end of the lever and the feed be controlled by withdrawing the screw, F. By means of the stop screw, *a*, any number of holes may be drilled exactly to the same depth.

The machine is provided with a treadle, but fast and loose pulleys can be fitted to it, as shown in dotted lines.

Practical Uses of the Electro-Magnet.

The following description of the practical employment of the electro-magnet is taken from the Pittsburg *Press:*

"S. T. Wellman, the superintendent of the big steel works at Cleveland, conceived the notion some time ago that a large electro-magnet, suspended by a chain from a crane, could be employed very profitably for lifting masses of iron. Not being an electrician, he did not see his way to carrying the thing out practically. Mr. Berry, an electrical engineer of Pittsburg, being on the spot, volunteered his advice and superintendence. Together they brought the thing to completion, and it is now working with great perfection.

"For the construction of the electro-magnet to be experimented with, two bars of soft iron were taken, each being fourteen inches long and three inches in diameter. They were wrapped with a multitude of strands of No. 14 B. & S. gauge covered wire. To combine the two separate magnets thus formed into one, they were linked together on top by a third soft iron bar, square in the cross section.

"For trial of the magnet at portative work it was suspended by a rope from a pneumatic crane. Rope was used, as it was found that a chain became magnetized and did not act very well. The current power sent through the wire to induce the magnetism was that of 5½ to 6 amperes. It was found that a weight of 800 pounds could be lifted up handily, and, by shutting off the current and lowering the magnet, deposited anywhere very easily. . . . At one part of the factory where this electro-magnet has been put up, fourteen or fifteen Polacks have been wont to be kept employed at this work. They are now in the position of Othello in the matter of occupation, the magnet picking up two or three billets at a time and depositing them in a car.

"If the thing works permanently, as it appeared to be working when Mr. Berry left Cleveland, it looks as if one boy would be able to do the work of a gang of men. His duties will be those of lowering the magnet from the crane on to some billets, turning on the current, swinging the magnet around to the top of a car, cutting off the current, and bringing the crane back to its first position. The crane used is one of a very superior class, being adapted to turning in any possible direction almost, at a slight movement from a pneumatic valve.

"The turning off and on the electric switch, of course, would require no expenditure of energy that would be worth speaking of at all. It is intended to construct an electro-magnet of softer and more appropriate iron than that of which the first experimental one was made. The amount of current, also, will be arranged so that only a portative capacity of 150 pounds or so, at the poles of the combined magnet, will be produced."

Parasites on Live Stock.

At the end of the winter, colts, calves, and older stock are very apt to be crowded with these objectionable parasites. They thrive best upon poor animals, and are supposed to be bred by old, worn out, and miserable creatures. However this may be, there is no doubt that they find a suitable home in the dirty matted hair in the late winter or early spring months, and on a sunny day may be seen literally in millions, every hair having nits upon it. One reason of so much rubbish accompanying them is that in the course of their development from the egg to the mature louse the skin is cast several times.

To get rid of them is not always easy, as the length of coat and accumulation of dandruff or scurf makes a waterproof covering that resists many remedies which in themselves are certain destroyers if only brought into contact with the parasites.

A sunny day should be chosen, and the early part of it, when a bountiful washing with soft soap and hot water should be undertaken, so as to clear the skin of grease and dirt before applying the remedy. Staves-acre is an effectual destroyer of lice if prepared by boiling ½ pound with a gallon of water and brushing well into the coat with a hard brush.

Tobacco juice is also much in request for the purpose, and can be procured from druggists at a very low rate, as it is imported now free of duty, or only a nominal duty, and the old expensive plan of boiling or infusing good shag tobacco is not necessary. By the way, very few people avail themselves of the governmental privileges of growing sufficient tobacco for this and fumigating purposes, though they might easily do so.

Paraffin is sometimes used, but is a very dangerous remedy, occasionally being absorbed and causing the death of the animal, and not unfrequently causing a blister, and much unnecessary pain, and subsequent blemish.

There is another kind of louse from which horses suffer, which, if once seen, can never be forgotten—we refer to poultry lousiness. It will sometimes happen that a horse stabled with fowls will become affected and literally tear himself to pieces with them unless promptly treated with one of the foregoing remedies, either of which is as effectual against these as against the ordinary louse.

In washing or applying any remedy, it should always be commenced near the eyes and worked backward, as if any other plan is adopted the besieged retreat into the mane and ears, and many escape altogether, like the rats that are left just to keep up the breed after the rat catcher has gone.

It is always well to repeat the dressing and keep the animals moving about till dry, or they may lick off more lotion than is good for them, or stand about and get chilled.—*Chemist and Druggist.*

A DEVICE FOR PROTECTING GARMENTS.

The vest protector shown herewith has been patented by Mr. Benjamin Ives, of St. Paul, Minn. It is an apron of felt or other suitable material, having a binding on its upper edge, in which, near opposite edges of the apron, are formed holes for receiving an S-shaped hook, by which the protector may be supported from the edges of the vest pockets, for protecting garments against wear by contact with the edges of desks and counters.

IVES' VEST PROTECTOR.

Dynamite—Its Uses and How to Handle It.

Although dynamite has been in use for considerable time, from the number of inquiries from every part of the globe relative to its ingredients, its explosive force, and how to handle it with safety, we conclude but few comparatively know but little about it. The following, from the *Indian Engineer*, published at Calcutta, gives the information which many are seeking to know.

Dynamite consists of some porous absorbent mineral saturated with nitro-glycerine. Several substances have been tried as absorbents of the glycerine, but the most satisfactory is the *kieselguhr*, an infusorial earth, composed of the silicious shells of extremely small vegetable organisms, and it is of this that Nobel's dynamite is made. It absorbs about three times its weight of the glycerine, and resembles putty in appearance. Thus, a given quantity will contain 75 per cent of the real explosive, and its blasting power compared with pure nitro-glycerine is, of course, represented by the same ratio. In order to explode it, it is necessary to obtain the temperature of 360° Fahrenheit. It freezes in the same way as glycerine, and when in this state must be carefully handled. Nitro-glycerine has an expansive force ten times that of an equal weight of powder. It is highly dangerous to place dynamite on or near fire stoves, steam pipes, or any highly heated metal. Dynamite must never be put into warm water to thaw it, as the water would free the nitro-glycerine, when it is most dangerous. It ought always to be put into a water-tight vessel, and then have the vessel put into warm water. It should never be exposed to the direct rays of a tropical sun. When loading it, a wooden rod or squeezer should be used to push home the cartridge, *never a metal one*, and the charge should gently and firmly be pushed down, and not rammed or pounded.

If dynamite has to be loaded into tins, avoid smelling it, as it gives a sickly, nervous headache for several days. Never squeeze the primer containing the detonator, but lower or push it gently till it rests on the charge. For tampings, and or water should be used. In the event of a misfire, never attempt to draw the tamping. If water tamping has been used, put a fresh primer and detonator on top of the charge. If other than water tamping has been used, bore a fresh hole. The detonator must be very carefully handled. If one exploded in the hand, the hand would be shattered. When putting in the fuse, cut off the end of it square, and put it in firmly, but gently. Dynamite can be burnt with safety, and simply fizzes up harmlessly. It exercises its force in the direction of most resistance. A single cartridge attached to a rail will break it; a 4 oz. cartridge will break a 35 lb. railway rail in two. The charge varies from a few cartridges to as much as may be necessary.

Dynamite is generally packed up in dealwood boxes containing 50 lb. Each box contains five separate packages of 10 lb., and in the package ½ oz. and 2 oz. cartridges are mixed. They are all the same power, but the ½ oz. cartridges are called primers, and used for exploding charges. The detonators are long copper caps, filled with a heavy charge of chloride of mercury. They must be kept quite dry, and always separate from the dynamite. It is sold in boxes of 200 caps. The fuse used is of various sorts. The most useful is the black fuse sold in coils of 24 feet. It burns at the rate of a yard a minute.

A School for Fire Horses.

At 58 Lawrence Street, Harlem, is the famous training school for all the fine, intelligent horses of the New York Fire Department. Here, says the New York *World*, the green horses are brought and trained to jump from their stalls at the first sound of the alarm gong and rush out to their stations, where they stand ready for the lightning-like adjustment of the harness, and quivering with impatience for the great doors to be thrown back, that they may whirl the ponderous engine or hose carriage out into the street. Veterinary surgeon Joseph Shea, who ranks as a captain in the department, is in command of this equine kindergarten, and is ably assisted by Foreman Lawrence Murphy, Firemen Patrick Haley and Thomas Clark.

About sixty perfectly trained horses are turned out from this school yearly. Captain Shea does not attend to the training as much as to the buying and matching of the animals. He goes at regular intervals to Bull's Head, buys those horses that his judgment tells him are what he requires, and, sending them to the school, leaves them in the hands of Foreman Murphy and his two assistants. It astonishes one to find how rapidly this training is accomplished. The average horse understands his new duties pretty thoroughly at the end of two days, and the least intelligent of them never takes longer than a week to learn the ropes. After thoroughly testing the green animal to find if his "wind" is in perfect condition, he is put in a stall and led backward and forward to his station before the engine some dozen times or so to accustom him to ducking his head to get under the collar and harness. Then he is left in his stall and coaxed to come forward under the harness himself by kind words and rewards of candy and apples. He is then taught to come forward at the clang of the gong, and after a little practice at this his education is complete, and he is transferred to one of the regular fire houses.

The system of training here is entirely that of kindness, and recourse to the whip is never necessary. The horses seem to like the work, and grow as enthusiastic over it as one of the old volunteer firemen. Of course horses that do this kind of work have to be both strong and speedy. Three hundred dollars is the average price paid for them, and they must be between sixteen and sixteen and one half hands high, weigh from 1,200 to 1,450 pounds, and be from four to six years old. Their usual length of active service is about five years. They are then auctioned off, and bring from $50 to $150.

This institution is also a kind of "hors-pital," and the fire horses that fall ill with distemper, or pinkeye, or become lame, are sent here to be nursed back to health. Captain Shea is fond of perfectly mated teams, and takes a great deal of extra trouble in transferring horses from one station to another, in order that, as nearly as is possible, every team in the department may be perfectly matched in size, appearance, and working qualities. The old chemical fire engines are used in the school for the horses to practice running with, and four of them have been racked to pieces since the establishment of this institution, March 23, 1882. The one now in use is the old Morrisania engine, and it looks as if it were on its last legs, or, more correctly speaking, on its last wheels.

This school was started merely as an experiment, and as such was provided with what was thought to be temporary quarters in an old engine house. It has proved a big success, but nothing has been done to improve the accommodations. The building is too small for the amount of work done there, and is in need of repairs. The general opinion of the firemen is that there should be nearly double the number of teachers there, and accommodations for twenty instead of seven horses, so that in the spring, when the going is always heavy and many horses ill from the hard work of the winter, there would be absolutely no danger of running short of trained animals. M. Surat, who came from France some years ago to study the methods of the New York Fire Department, was particularly struck with the equine training school, and when Chief Gicquel and President Purroy visited France a year, ago they saw in Paris a school on exactly the plan of this one, but fitted up more completely.

Atmospheric Electricity.

At a recent meeting of the Royal Meteorological Society, the president (Dr. Marcet) delivered an address on "Atmospheric Electricity." He first alluded to Franklin's experiments in America in 1752, in which he succeeded in obtaining the electricity of a storm cloud by conducting it along the string of a kite sent into the cloud. De Romas in Europe repeated the experiment, and having placed a wire within the twine his kite was attached to, obtained sparks of 9 feet or 10 feet in length. The characters of the two kinds of electricities were next described, the vitreous or positive, which was produced by rubbing glass, and the resinous or negative, obtained by rubbing sealing wax or other resinous substances; and it was shown by bringing suspended balls of pith within the influence of these electricities, that electricities of different kinds attract each other, and those of the same kind repel each other. De Saussure's and Volta's electroscopes were next described, pith balls being used in the former and blades of straw in the latter for testing the pressure of electricity. With the object of measuring the force of electricity, Sir W. Thomson's electrometer was mentioned, in which the electricity is collected from the air by means of an insulated cistern letting out water drop by drop, each drop becoming covered with electricity from the atmosphere, and running into the cistern, where it is stored up, and made to act upon that portion of the instrument which records its degree or amount. The atmosphere is always more or less electrical, or, in other words, possessed of electrical tension, and this is nearly always positive, while the earth exhibits electrical characters of a negative kind. The effects of atmospheric electricity were classed by Dr. Marcet under three heads: 1. Lightning in thunder storms. 2. The formation of hail. 3. The formation of the aurora borealis and australis. He explained how clouds acquired their electrical activity by remarking that clouds forming in a blue sky, by a local condensation of moisture, became charged with positive electricity from the atmosphere, while heavy dark clouds rising from below nearer to the earth were filled with terrestrial negative electricity, and the two systems of clouds, attracting each other, would discharge their electricity, giving rise to flashes of lightning. In some cases a storm cloud charged with positive electricity would approach the earth, attracting the terrestrial negative electricity, and when within a certain distance shoot out a lightning which would apparently strike the earth, but it would just as well have struck the cloud, only there was nothing in the cloud to sustain any damage, while on the earth there were many objects that lightning would destroy, to say nothing of its effects upon animal life. Thunder is the noise produced by the air rushing in to fill up the vacuum made by the heat of the lightning flash. There may be sheet lightnings, zigzag or forked lightnings, and globular lightnings. The latter are particularly interesting from their assuming a spherical form. Illustrations were given of objects struck by lightning, the most remarkable being, perhaps, the clothes of a working man which were torn into shreds while the man himself was not seriously injured.

Dr. Marcet next proceeded to show a flash of lightning, which he produced by throwing on a white screen the image of an electric spark 2 inches or 3 inches in length, enlarged by means of the lens of an optical lantern; forked lightning, 6 feet or 8 feet in length, with its irregular, zigzag course, was most clearly demonstrated. After alluding to the protecting power of lightning conductors and their construction, Dr. Marcet explained the formation of hail and of waterspouts, and exhibited an instrument by Professor Colladon, of Geneva, for showing the formation of waterspouts. He concluded his address with a few remarks on the aurora borealis and australis, the formation of which was illustrated by De la Rue's experiment, which consisted of successive discharges of electric sparks through a partial vacuum while under the influence of a powerful magnet. Electric sheets of light were seen assuming the form of bands, and possessed of a certain rotating motion.

In connection with this meeting a most interesting exhibition of instruments was arranged in the rooms of the Institution of Civil Engineers. The exhibition was devoted chiefly to instruments connected with atmospheric electricity. There were various forms of electrometers, including those formerly in use at the Greenwich and Kew observatories. Numerous patterns of lightning conductors were exhibited, together with models of churches, houses, chimney shafts, and ships, showing the various methods of protection. The postal department showed a number of lightning protectors used for telegraph purposes. Many objects damaged by lightning were exhibited, including lightning conductors, telegraph apparatus, portions of rafters, trees, etc., also the clothes of a man torn off his body by lightning. An interesting collection of meteorites and some alleged thunderbolts were shown, the latter being of an amusing character. There were also several new meteorological instruments exhibited, which had been brought out during the past year.

One of the special features of the exhibition was a most valuable and interesting collection of over fifty photographs of lightning flashes. Many of these were taken during the great thunder storm which occurred in London on August 17 last year, while others were taken in various parts of the world.

The exhibition also included a large number of photographs of damage by lightning, and photographs of clouds and meteorological instruments, as well as records of atmospheric electricity, etc.

The Yellow River of China.

The Yellow River, from the enormous rapidity of its volume when swollen by melted snow, is the worst of offenders. Its new bed, even in twenty-five years, has risen far above the plain, and as the dikes grow from hillocks into hills, from mere walls into ranges of earthworks like fortress sides, hundreds of miles long, the effort overtaxes the skill of the engineers and the perseverance even of Chinese laborers. The ablest engineers in India were beaten by the Damoodah, though it is, compared with the Hoang-Ho, like a trumpery European stream, and though the labor available could hardly be exhausted. The truth of the matter is that, in all such cases, the upper sections of the dikes cost too much for complete repair, and tend to be inadequate; and when the Yellow River, gorged with water from the mountains till it forms in reality a gigantic reservoir, averaging a mile broad, from 300 to 500 miles long and 70 feet deep, all suspended in air by artificial supports, comes rushing down in autumn, the slightest weakness in those supports is fatal.

On September 27, the river was at its fullest, its speed was at its highest, there was almost certainly a driving wind from the west, a bit of dike gave way, the rent spread for 1,200 yards, and—our readers remember, for Charles Reade described it, the rush into Sheffield of the Holmfirth reservoir. Multiply that, if you can, by 2,000, add exhaustless renewals of the water from behind—five Danubes pouring from a height for two months on end—and instead of a long valley with high sides which can be reached, think of a vast, open plain, flat as Salisbury Plain, but studded with 3,000 villages, all swarming as English villages never swarm, and you may gain a conception of a scene hardly rivaled since the deluge. The torrent, it is known, in its first and grandest rush, though throwing out rivers at every moment at every incline of the land, had for its center a stream thirty miles wide and ten feet deep, traveling probably at twenty miles an hour—a force as irresistible as that of lava. No tree could last ten minutes, no house five, the very soil would be carried away as by a supernatural plowshare, and as for man—an ant in a broken stop cock in a London street would be more powerful than he. Swim? As well wrestle with the Holyhead express. Flee? It takes hours in such a plain to reach a hillock three feet high, the water the while pouring on faster than a hunter's gallop. There is no more escape from such a flood than there is escape from the will of God, and those Chinese who refused even to struggle were the happiest of all, because the quickest dead. Over a territory of 10,000 square miles, or two Yorkshires at least (for the missionaries report a wider area), over thousands of villages—3,000 certainly, even if the capital is not gone, as is believed—the soft water passed, silently strangling every living thing, the cows and the sheep as well as their owners; and for ourselves, who have seen the scene only on a petty scale, we doubt whether the "best informed European in Pekin" is not right when he calculates the destruction of life at 7,000,000.—*The Spectator* (*London*).

A Novelty in Voting.

Messrs. Richard H. Dana and Morrill Wyman, Jr., have prepared for the committee on election laws of the Massachusetts legislature a ballot which is, says the *Nation*, in many respects, the best measure of the kind we have yet seen.

Their bill opens with a provision that all ballots shall be printed and distributed at public expense. Upon that point there is no longer any division of opinion, everybody conceding the wisdom of taking from the political organizations the dangerous and corrupting control of the ballots which have been so long in their hands.

Each ballot "shall contain the name, residence (with street and number in city elections), and party or political appellation of every candidate whose nomination for any office to be specified in the ballot has been duly made," the names to be arranged in alphabetical order, except that presidential electors are to be arranged in a separate group. The provision for distributing the ballots to the election officers at the polls is so specific and so interesting as an effective means for preventing forgery of the official ballots that we give it in full:

"Section 14. The secretary of the commonwealth shall send the proper ballots, specimen ballots, and cards of instruction printed by him, to the several city and town clerks, so as to be received, one set at least forty-eight hours before the day of election, the other set sent separately so as to be received at least twenty-four hours before the day of election. These ballots, specimen ballots, and cards shall be sent in separate sealed packages clearly marked on the outside for the polling place for which they are intended, and the number of ballots inclosed. The ballots, specimen ballots, and cards of instruction printed by the city clerks shall each set be packed in separate sealed packages clearly marked on the outside for the polling precincts for which they are intended. The city and town clerks shall send to the several officers of each precinct or to the selectmen of the town before the opening of the polls on election day, in the manner in which the ballot boxes are required to be sent, one full set of the packages of ballots, specimen ballots, and cards intended for that polling place, keeping a record of the number of ballots sent to each polling place. The second set shall be retained until they are needed for the purposes of voting. At the opening of the polls in each polling place the seals of the packages shall be publicly broken and the packages opened and the books of ballots handed to the ballot officers hereinafter provided for by the precinct officer or the selectmen of the town presiding at such polling places. The cards of instruction shall be posted in each place provided for the marking of the ballots, hereinafter provided for, and not less than three such cards, and also not less than five specimen ballots, posted in and about the polling place outside the guard rails, before any ballot is delivered to any voter."

When the voter receives his ballot, after he has shown that he is entitled to vote, he must go alone into a compartment and check with a cross in the margin of the ballot the names of the candidates for whom he wishes to vote. Then he must fold his ballot so that the official indorsement on the back will be visible, and, coming from the compartment, deposit it in the ballot box. No ballot without the official indorsement can be received by the officers in charge of the ballot boxes, and if any such should get in, it must be thrown out in the counting. Any voter who allows his ballot to be seen by any person with the apparent intention of letting it be known how he has voted or intends to vote, or any person who interferes or attempts to interfere with any voter while marking his ballot, or who attempts to ascertain in any way how he has voted, shall be punished by a fine of not less than $5 or more than $100.

Adulterated Lard.

BY STEPHEN P. SHARPLES, STATE ASSAYER, MASSACHUSETTS.

In the interest of pure food the testimony of Mr. N. K. Fairbanks and Mr. Webster, before the Committee on Agriculture of the United States Senate, should have wide circulation.

They testified that "all of the lard on the market marked 'Prime Family Refined Lard,' 'Choice Refined Lard,' and other brands of this nature is mixed with more or less beef stearin and cotton seed oil."

As it is well known that cotton seed oil is a semi-drying oil, having strong siccative properties at the temperature of 212° F., this admixture unfits the lard for many uses.

It is impossible to make good biscuits with such a compound, as they rapidly become rancid.

The above gentlemen represent two of the largest firms in the so-called "refining" business in Chicago.

The refining of lard consists solely in adulterating it with cotton seed oil and oleostearin.

These mixtures may be easily detected. The usual tests for detecting cotton seed oil in olive oil answer every purpose. Bechi's test, as given in the *Analyst*, gives good results. Lard is without action on the solutions used. Nitric acid of 1·35 specific gravity gives only a faint color with pure lard, with lard adulterated with cotton seed oil it gives a color more or less intense, varying with the quality and quantity of the oil used. For the beef stearin the best test is that proposed by Dr. Belfield, of Chicago, as follows: The suspected lard is dissolved in ethylic ether, so as to form a nearly saturated solution. This is best done in an ordinary five inch test tube, which should be about two-thirds filled with the mixture. The top of the tube is then loosely stopped with cotton wool, and it is placed in a quiet place, at a temperature of about sixty degrees, and allowed to stand until crystals commence to form. These crystals are removed from the tube with a dipping tube and placed on a microscope slide; they are quickly covered with a thin cover glass, pressed enough to flatten the grains, and then examined with a quarter inch objective.

Pure lard gives large flat plates with well defined oblique terminations. These are sometimes in radiated groups, but often occur singly. Beef fat always crystallizes in radiating tufts, often resembling wheat sheaves, and the crystals are either pointed or else have nearly square terminations. They are always, however, much more slender than the lard crystals.

Watering lard has almost become one of the lost arts. Only one sample from nearly a hundred examined had any marked amount of water. This one, however, had over forty per cent. It was kept in combination by means of an alkali.—*The Analyst*.

ENGLISH RAILWAY COUPLINGS.

As inquiry is sometimes made respecting the best forms used for coupling cars on English railways, we have thought some of our readers might be interested in the following illustrations, which we take from *Engineering*, which it states embody the latest devices for coupling and uncoupling. They are the invention of Edward J. Hill, of London. Figs. 3 and 4 represent an uncoupler solely, while the arrangement shown in Figs. 1 and 2 serves both to couple and uncouple. The uncoupler, Figs. 3 and 4, consists of a stamping or steel casting which stands astride of the wagon hook and is pivoted on the shackle pin or Gedge link. When placed in position, a touch with a hammer turns over the fingers or horns, which embrace the top of the link in the draw bar or the shackle pin, and secures the uncoupler. The device is operated by means of a chain fastened at the center to the end of the uncoupler, and which then passes round two guide pulleys, and ends in two staples, one over each buffer. A hand ring is secured near each end of the chain, and by pulling on one of these rings the uncoupler is raised, and in rising it lifts the coupling chain up the hook until it carries it over the point and allows it to drop free. The operation is perfectly simple, and any one can perform it without instruction—the chain is pulled, the uncoupler is raised, and the link is pushed off the hook, much in the same way that the unfortunate hedge sparrow is hoisted over the brink of the parental nest by the sagacious cuckoo. Several uncouplers are in experimental use on the London, Chatham, and Dover Railway, and have been highly approved by the district inspectors.

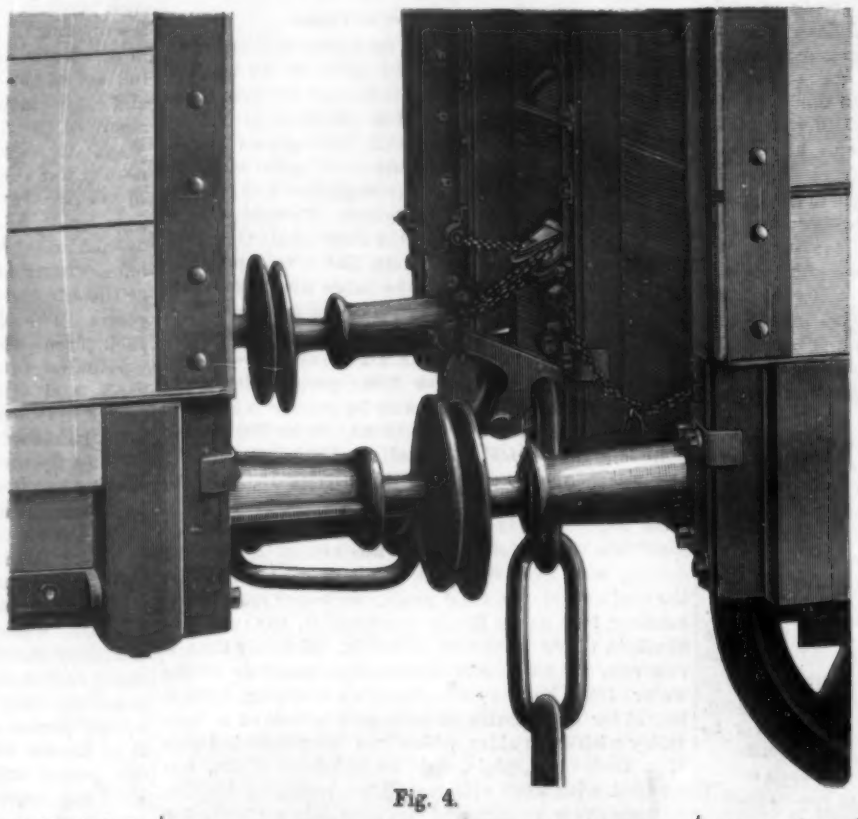


Fig. 4.

Simple as is the foregoing arrangement, it is inferior to that shown in Figs. 1 and 2, which performs the double function of coupling and uncoupling. There is bolted to the headstock of the wagon a bracket in which there is pivoted a long arm which normally lies parallel with the end of the wagon above the hook. The bracket is so tilted that when the arm is moved from the position shown in Fig. 2 to that in Fig. 1, the end rises considerably, until it comes into a direct line with the opposite drawbar hook of the next truck, when it is arrested by a stop in the bracket. This end is provided with an eye, through which there runs a chain connected at its outer extremity to a light clip fixed to the last link of the coupling chain. The other end of the hand chain runs round a sheave over one buffer, and is then connected to a stranded wire, which has a handle situated near the other buffer. Now, when the handle is pulled (Fig. 2), or the chain (Fig. 1), the arm is rotated on its pivot, carrying the coupling chain forward. At the same time the hand chain is drawn through the eye and the end of the arm, and lifts the coupling until it stands in a position (Fig. 1) ready to drop over the hook of an approaching vehicle. By suddenly releasing the hand chain, the coupling is effected. When uncoupling is to be effected, the operation is just as easy. Tightening the hand chain brings the arm up over the coupling, and then a pull lifts the link off the hook, the hand chain is then released gently, and the coupling chain swings aside clear of the hook and falls into the position illustrated in Fig. 2.

Fig 3.

The Dangers of Gasoline.

The Michigan State Board of Health, in a circular just published, gives the following succinct rules for the use and care of gasoline. Every person employing or keeping gasoline should keep constantly in mind the following facts and cautions respecting its use:

1. Gasoline is an extremely dangerous, explosive substance. 2. It should be kept in a cool, well ventilated place, if possible out of doors, or in an outbuilding, never in a kitchen, closet, or cellar. 3. A vessel containing gasoline, unless tightly closed, should never be brought within ten feet of a lamp, stove, grate, flame, or fire of any sort. The small flame of a match or even a spark is sufficient to explode the gas when present in sufficient quantity. 4. The vapor of gasoline may be carried by a draught or current of air, and thus be brought in contact with fire at considerable distance, even greater than that mentioned in the preceding paragraph, consequently gasoline should never be opened or poured from one vessel to another in a current of air, unless the current is from the room out of doors. 5. The danger in connection with the use of gasoline stoves is not so much in the stoves themselves as in having the gasoline about, yet, by continued use, the valves of a stove may become worn, so that leaks may occur, and thus a stove may become a source of great danger. 6. If an overflow of gasoline occurs from being turned on too freely, from leakage of valves, or from the blowing out of the generating burner, as sometimes accidentally occurs, the surplus gasoline should be carefully wiped up, and the room should be well aired by the opening of windows and doors before the burner is lighted. 7. If an open vessel containing gasoline has been standing in a room over-night, or an overflow has occurred during the night, or if there is found in a room a strong smell of gasoline at any time, the room should be opened and well aired before a match is lighted or a lighted lamp or candle is carried into the room. 8. Gasoline should never be used for lighting a fire. An explosion, which may possibly be fatal in its effects, is almost certain to follow. Persons have been maimed for life in this way. 9. The use of gasoline lamps is, if possible, attended with even greater dangers than the use of gasoline stoves. 10. A wise regard for safety will lead to disuse of gasoline in any form for domestic purposes. 11. Gas or kerosene stoves may be substituted for gasoline stoves, but neither gas, gasoline, nor kerosene stoves are so safe or healthful as the ordinary wood or coal stove. The ordinary stove aids in the ventilation of the room, and carries away the poisonous gases formed by the combustion of the fuel, whereas the other forms of stoves discharge the products of combustion into the air of the room, compelling the occupants to breathe the poisonous gases. Neither gas, gasoline, nor kerosene stoves should ever be employed in other than very open or well ventilated rooms, unless provided with a special flue or ventilating duct for the purpose of carrying off the products of combustion.

An Expression of Animal Sympathy.

While riding along a country road in the environs of Cincinnati, Ohio, about the 1st of last October, I noticed a remarkable and very amusing display of animal intelligence. In a field beneath some trees at the bottom of a very high hill stood facing each other a donkey and a young bull. The bull was standing very patiently, slightly nodding his head up and down, while the donkey, with a rather heavy stick about two feet long in his mouth, was scratching his companion's forehead. Once the donkey dropped his instrument, but, without hesitation, lowered his head, picked up the club again with his teeth, and continued scratching very gravely, to the evident satisfaction of the bull. We often see two cows "rubbing horns," and whether this was a return for a similar favor from the bull or not, the donkey very clearly realized his poverty in the matter of horns, and happily supplied the deficiency.—*Charles L. Edwards, Amer. Naturalist.*

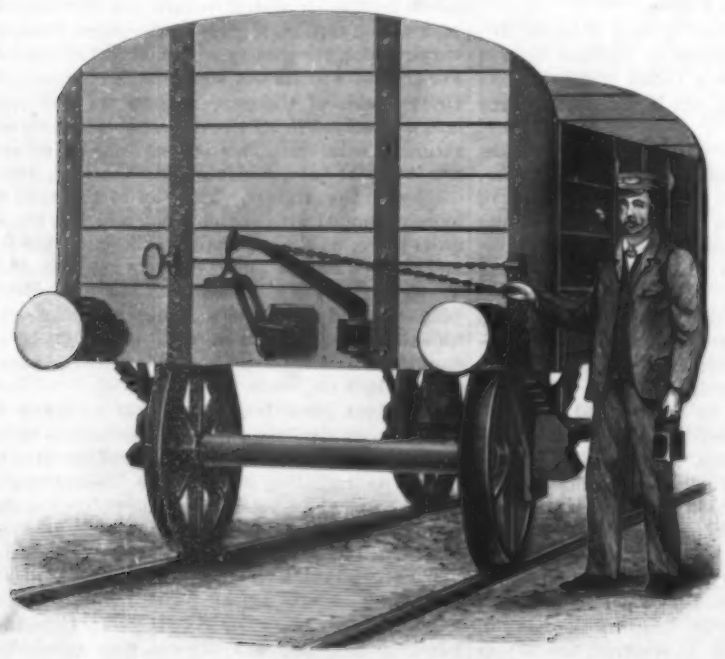


Fig. 1.

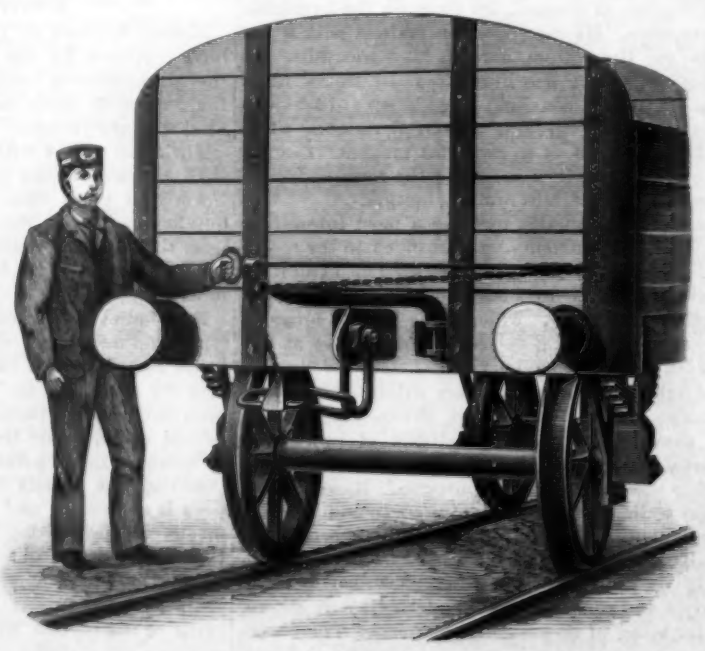


Fig. 2.

ENGLISH COUPLING AND UNCOUPLING DEVICES.

A NEWLY DISCOVERED WILD GOAT (*Capra dorcas*).

The discovery of a new world is greeted with enthusiasm by astronomers, but zoologists very seldom enjoy a similar pleasure, for the dominion of the animal world, especially that of the higher classes of animals, has been very thoroughly explored. So much the greater, therefore, was the sensation caused by the account of a hitherto unknown wild goat, which has recently circulated through the German press. The fact that the animal was from a European country, and not from some distant part of the world, added greatly to the interest taken in it.

"Polyaigos," *i. e.*, goat realm, was the ancient name for the home of this goat, which is the little island of Joura (Giura), one of the Sporades, lying to the north of Eubœa. The inaccessibility of the island was favorable to the increase of the animal. A person who visited the place later than 1848 reported that it was swarming with goats, but he could tell nothing of their species. Between 1850 and 1860 a young specimen came into the possession of the Austrian consul at Crete, but it was supposed to belong to the *Capra ægagrus* of Asia Minor. After that nothing was heard of the animal until the explorer E. v. Oertzen succeeded in catching a wild goat on the island of Joura. It was determined that it did not belong to the *Capra ægagrus*, and Dr. Reichenow named it *Capra dorcas*.

The creature is of remarkably strong build, is smaller than the common goat, and is characterized by a coat of dark brown, marked with black bands. His sinewy legs remind one of the chamois. The assertion that this wild goat attacked the hunter and threw him into a rocky ravine seems perfectly credible after one or two experiences with the specimen in the Berlin Zoological Garden. The two year old buck there gets on very well with his companions, but the sight of a man enrages him so that he rushes with great bounds toward the visitor, throwing himself with such force against the bars that they would long ago have been broken had not special care been taken to prevent such an accident. In spite of the failure of his daily attempts to attack great and small, he does not lose his pugnacious disposition, and a vain charge is made every time that a new comer appears, so that ladies and children often start back with cries of alarm.

Unfortunately, the wild goat of Joura is nearly extinct; and the improved firearms will soon exterminate him. It is, therefore, greatly desired, in the interest of science, that the slaughter shall end, and that steps shall be taken for the preservation of the species.—*Illustrirte Zeitung.*

A NEWLY DISCOVERED GOAT—CAPRA DORCAS—NOW IN THE ZOOLOGICAL GARDEN, BERLIN.

The Canon Wren.

E. M. HASBROUCK.

Who in wandering through the woods or along the banks of some rippling stream in early spring has not heard with delight the familiar note of some well known bird, or listened with eager ears for the faintest note that should proclaim the arrival of the first of a myriad of birds that in the course of a few weeks will swarm through the fields and forests? What lover of nature, upon hearing a song unfamiliar to the ear, has not felt a keen desire to trace it to its source, and labored long and patiently to find from whence it proceeded?

Long ago, when our country was comparatively new and naturalists few and far between, hundreds of birds whose notes had never been heard by men of science flitted through the woods, and whose songs, when heard for the first time, were a source of pleasure seldom equaled, and occasioned a feeling akin to idolatry.

Owing to the efforts of ornithologists, this state of affairs no longer exists. True, there is still much to be accomplished in the study of the singing of our birds; but to hear something comparatively new, something not constantly heard of and talked about, it is necessary to enter the more remote and isolate portions of the country, and to traverse the mountains and valleys seldom trodden by man. It is in such localities as this, in the southwestern part of the United States, that the canon wren (*Catherpes mexicanus conspersus*) is to be found. Here—no matter how lonely, darksome, or dreary the vale, no matter what dearth of life is otherwise to be found—the clear, melodious song of this bird breaks forth from the gloom and thrills the very soul of the listener as with something holy. This is entirely different from the song of any of our birds, and is as marvelous for its character as for its clearness and strength, consisting of a series of eight or ten notes, descending regularly as does the musical scale until the lowest note is reached, each clear and distinct, but prolonged so as to glide smoothly into the next.

I remember well the first time I heard it. I had been climbing the "Bee Rocks" near Meridian, Texas, and on reaching the summit paused a moment for breath and to rest. From a considerable elevation I looked across the Bosque valley to the hills on the opposite side, and along the river for a distance of twenty miles in either direction. The bed, owing to a three years' drought, was dry, save for a few stagnant pools of water, and the valley, although still of a sickly green, contained but little animal life.

In the air above circled countless numbers of vultures, while on the edge of the cliffs perched swarms too gorged to fly, but at times dispelling the monotony by shifting their location in long, awkward hops. The whole presented a scene similar to some of those described by Dante, and a more gloomy and desolate spot would be hard to find. While comparing it with a landscape viewed from a similar location in central New Hampshire, the wonderful note of the canon wren burst upon the air. It was repeated several times at intervals of about three minutes, when it was answered by another lower down on the cliff. Both sang for some moments, then all was hushed as before. That the rocks had now a new interest and had assumed a different aspect can be readily imagined. For some time I waited in vain for it to be repeated, when of a sudden it burst forth again, seemingly directly beneath me. Crawling to the edge and peering over the cliff, the author was discovered some distance below flitting from rock to rock, pausing occasionally to give utterance to its song, then resuming its occupation. To descend to a point about on a level with the bird and conceal myself was the work of a few moments. Presently, with a "chip" and flutter the little songster entered my retreat, visiting every nook and cranny, peering into every crack and crevice in search of insects. Yet it never for a moment lost sight of me. Coming at times to within a few feet of my hands, it would dart to the opposite side of the cavern and view me from another quarter. Whether it possessed that peculiar, hoarse, chattering note common to most of the family, I was at a loss to know until, by accident, I moved slightly, when, with a sudden movement, it dashed across the open space, plunged into the bushes, and descended gradually to the bottom of the valley, scolding to itself all the way. During the next half hour a dozen or more individuals were heard, and many others were undoubtedly in the vicinity. Descending now some fifty feet to a shelf which runs the entire length of the rocks, I followed it for some distance, and was pleased to note a number of the birds in question clinging to the walls, darting into the air, and seizing insects in the manner of the *Tyrannidæ*, disappearing from view for a time while they searched the interior of some dark retreat and appearing again often where least expected; on one occasion I observed one to enter an orifice in the rocks some twenty feet distant, and while watching closely for its return was amused to have it dart from a hole directly before my face. The bird was fully as surprised as myself and considerably more frightened, for it dashed around a neighboring bluff and went some distance down the cliffs.

This closed my experience with them until later in the season, when I again met a few in the vicinity of Comanche peak, in Hood county, and again a week later on Paluxy creek, but it was now late in the fall and their voice had lost much of its melody and richness. They are never, I believe, to be found at any great distance from the gorges and cliffs, which are their favorite haunts, and while the beauty of other localities is enriched by the songs of hundreds of musical little throats, it is reserved for the present species to lift in part and to cheer the gloom which forever overshadows some of Nature's mightiest and grandest works.

A New Flameless Explosive.

A new variety of "securite" has been prepared by Herr Schoeneweg, which is said to be flameless when exploded, and will, it is expected, be of especial value as a substitute for ordinary blasting powder and other explosives in fiery coal mines. It consists of nitrated hydrocarbons mixed with an oxidizing agent, such as chlorate of potash and some organic salt which renders the mixture flameless. The substance is not hygroscopic, and is of a bright yellow color, and can be kept for any length of time without undergoing any change. It cannot be exploded by a flame nor by a hot substance, but only by a detonating cap. Recent experiments at Hendon have proved that the new explosive fulfills the anticipations of the inventor, and we understand that the Flameless Explosives Company have undertaken to introduce it to the notice of mine owners and others to whom an explosive of this nature should be welcome. Its power is said to be equal to that of No. 1 dynamite, and it can be manufactured at a less cost. The organic salt which is added to the "securite" to produce this effect has also the property of rendering dynamite similarly flameless when mixed with it.

Fire Escape for School Buildings.

A novel system of fire escape for school buildings has been suggested by Captain Reagan, assistant chief of the Boston fire department, which upon its face looks as if it might prove of considerable practical value. His idea is to utilize the large yard area to be found about nearly every school house in Boston, and erect an ornamental iron tower a short distance from the building. This tower would contain a broad iron staircase leading from the top to the ground. From each floor of the school house a covered bridge would lead into the tower, and the door leading from the schoolroom to the bridge would be kept unlocked during school hours. The rooms on each floor would connect with each other, and in case of fire the scholars could have unobstructed access to the bridge. By such an arrangement, whenever a fire broke out there would always be an egress open, and even if matters became serious, the iron tower and bridges would remain unharmed. The plan appears to be perfectly feasible, and the expense would, it is said, not be much more than what is laid out on the present fire escapes. And we should think the same plan might be adopted for factories and other buildings where numbers of persons are employed on the different floors of the building.—*Fire and Water.*

A New Mineralogical Association.

On Monday evening, April 16, 1888, after the adjournment of the regular business of the New York Academy of Sciences, the members interested in mineralogy held a meeting for the purpose of establishing a section on mineralogy. The section will meet when enough interesting material presents itself to insure a full evening of business, and will publish all papers presented before the Mineralogical Club in the proceedings of the Academy. Mr. George F. Kunz was elected president, and Mr. J. H. Caswell secretary of the section. The newly elected president is to deliver a lecture on "Precious Stones during the Last Decade" before the Boston Society of Arts, at the Massachusetts Institute of Technology, on Thursday evening, April 26.

Alloys.

The first of a series of three lectures on the subject of "Alloys" was recently delivered by Professor W. Chandler Roberts-Austen, F.R.S., before the Society of Arts, London. In commencing his lecture Professor Roberts-Austen stated that there was a popular impression that chemists had consigned alloys to oblivion, but this view was only partly true, as chemists were now turning to metallurgists for help in explaining the constitution of the various organic compounds. For centuries the history of chemistry was the history of alloys, and much valuable information on the subject was contained in ancient works on chemistry. The art of separating metals from their ores was quickly followed by the knowledge of uniting metal with metal to form valuable compounds. In early times many metals had been used in a native state which were now only used in the form of alloys. Thus Greek vases had been discovered consisting of practically pure antimony. Nevertheless, Dr. Schliemann's discoveries had proved that this people were acquainted with alloys of copper and silver, gold and silver, and silver and lead, all artificially prepared. Throughout the middle ages the action of a base metal on a noble one had been considered as corrupting the latter; but in 1540 Muschenbrock had contested this view, and at the same time had shown that metals should be united in definite weights and not at random.

There were four old writers who took a prominent place for their researches on alloys. These were Reaumur, Muschenbrock, Gellart, and Achart. Reaumur's observations on steel read like those of a modern writer. He stated that steel only differed from iron in being more easily penetrated by sulphurs and salts, and on this he founded a theory of the hardening of steel which, if he had only known that it was carbon and not sulphurs and salts the steel contained, would have been nearly identical with some modern views on this subject. Gellart considered the relation of fluid metals to each other regarded as solvents. He knew that by a superior solvent property one metal could displace another. Muschenbrock examined the tenacity of alloys, and obtained the results agreeing remarkably well with modern observations. Achart studied the electric behavior of these substances, and showed that with regard to their conductivity for heat and electricity they must be ranged in the same order. The importance of employing pure metals in forming alloys whose behavior was to be studied was not recognized till about the middle of the eighteenth century. In 1860 we come to Mathiesson's works, which were of the greatest value. He studied the effect of uniting metals on their electrical resistance, and pointed out that his results could not be explained unless the metal in the alloy existed in a different condition to that which we were accustomed to in the free state.

Alloys could be formed in different ways. The most usual was by fusing the constituents; but they could also be produced by the compression of metallic powders and by electro deposition.

Taking a piece of tin, which, as they knew, could be bent, emitting at the same time its peculiar cry, a small percentage of arsenic would destroy this cry, and a slightly greater amount would give an alloy having properties differing from both its constituents, and very closely resembling zinc. Rubbing a little mercury round a bar of tin, the latter was rapidly penetrated, and could then be broken with ease.

Some metals evolved heat in uniting, while others absorbed it, producing cold. Of the first class of alloys were aluminum and copper, platinum and tin, bismuth and lead. All these metals, however, united at a comparatively elevated temperature, so that the experiment could only be carried out in a laboratory. Mercury and sodium, however, also gave out heat in uniting, and this experiment he could show them in the room. Cold was produced by mixing together equivalents of tin, bismuth, and lead, in the form of powder, and finally adding mercury to the mixture. The heat absorbed was so great that by placing the above mixture in a small flask, standing on a wetted board, and then adding mercury, the flask would be frozen to the board. The same fact, as to the production of cold, could also be demonstrated with a thermopile. The above results led to important conclusions, which he would deal with in the third lecture. The result was not the same if one took fusible metal, consisting of the same ingredients fused together, and acted on it with mercury. Cold indeed was produced in the latter case, but not to nearly the same extent, thus showing that molecular work had been done in the act of fusion.

Mr. Spring had shown that by compressing metallic powders the whole might be welded into one solid mass. This led to important results, as Mohr had shown that cohesion itself was but a kind of chemical affinity. The welding was due to the pressure simply, and not to the heat generated during the process, which was totally insufficient for the purpose.

Though metals might be united by fusion or compression, it did not therefore follow that they would remain united in cooling. The little mass of metal he held in his hand was once a uniform molten mass of lead and zinc, but on cooling these had separated out so completely that he could flatten out the lead at one corner or crush the zinc at the other. A similar separation took place if a molten mass of copper, lead, and antimony was allowed to cool in a cylindrical mould. There was another class of alloys. Depretz had shown that when an alloy of rhodium and lead was treated with nitric acid, a black residue was obtained, which, in a vacuum, would deflagrate or even explode with the evolution of nitrogen and oxide of nitrogen, just like certain organic substances.

Guthrie showed that alloys in solidifying threw off certain groups of their constituents, and that in the alloy which finally remained, and was the most fusible of the set, the metals were not in atomic proportions. This was important, as Mendelejeff regarded solutions as strict chemical combinations at temperatures higher than their dissociation temperatures, and showed that alcohol would form perfectly definite hydrates with water. He had there an alloy which greatly resembled ordinary cast iron in appearance, and it did in fact consist of iron, with only a small proportion of antimony, yet on filing it the particles removed by the tool would take fire in passing through the air, thus demonstrating the great effect of small quantities of metals on each other, perhaps the most interesting branch of metallurgy.

Nothing New.

It is an easy matter to prove that there is nothing new in the world, and it has come to be the fashion to belittle about every invention made, by showing that something in some respects like the thing invented has been known or dreamed of before. As a general thing, remarks the *American Machinist*, these rusty resemblances are matters of very little consequence. They go to show that some one has tried to accomplish a certain purpose and has failed, his failure resulting in no benefit to the public.

When an inventor brings out something that accomplishes a useful purpose not before accomplished, or does this better or more economically than it has been done, it is reasonably certain he has invented something in the value of which he has an interest. And this point is the one that is overlooked by those who declaim against the rights of inventors in favor of some one who tried to do something similar twenty years before. The very fact that the party who tried first did not succeed is fairly good evidence that he did not make the invention. All recent construction of patent law is in favor of sustaining the inventor who accomplishes something, as against the man who has tried and failed, even though the means used are very similar. And this is justice and common sense. The patent laws are presumably in the interest of the public, and the public is interested in the inventor to exactly the extent that it is benefited by him.

The same spirit that leads people to detract from the credit of others by unearthing old material things that were never of any practical utility, leads them to a good deal of useless trouble in the way of digging up obsolete ideas and expressions to show that some modern writer has, after all, told nothing new, although to ordinary readers it may be of great practical value. In this case, as in the case of the machine or other patented device, the man who gives the knowledge to those who are in search of it is the one who deserves praise. It makes but little difference whether he does this by adding something that was lacking, or by putting what is really complete in its way into such shape as will make it serviceable to others.

There are a hundred devices not patented nor patentable, used here and there for certain mechanical purposes, that a knowledge of would be of material advantage to others. But those who could make this knowledge known are very frequently hindered from doing so because there is in all probability, somewhere, a man who stands ready to affirm that he has seen and used the same device. The knowledge of many a good thing is, kept from being made common because those who possess it are reasonably certain that it is not absolutely new. The man who has "seen it before" is not always a public benefactor, although he may be a very observing person.

The New Explosive "Hellhoffite."

The safe working of mineral property has for nearly twenty years been an anxious care to the legislature, to specialists, and to the general public in this country, and at present there still remain unsolved two mining problems of the greatest importance. A perfectly efficient and safe miner's lamp has yet to be provided, and colliery managers are still far from unanimous in their approval of an effective and at the same time harmless substitute for gunpowder and dynamite as explosive forces. The lamp question has continuously been the object of scientific application, but it is only recently that inventive genius has engaged itself in the task of modifying the process of breaking down minerals by means of dangerous explosives. Progress in this work has been marked by the water cartridge, gelatinous cartridge, securite, tonite, a variety of mechanical coal getters, and other more or less practically useful productions. "Hellhoffite," which is one of the latest additions to the list, hails from the Continent, and is said to be a harmless explosive. Hellhoffite is a red and rather caustic liquid, and is formed by a combination of the nitro-products of tar oils with nitric acid. It may also be obtained as a solid, this state being arrived at through absorption of the liquid by "kieselguhr"—fossil earth.

The cartridges which contain the explosive are made, for light charges, of refined lead, and these may be driven into the blast holes under pressure, are capable of filling up unevenly drilled holes, and can sustain deformations without their contents being affected. The explosive is fired by means of strong caps, primed with fulminate of mercury, inserted into small lead tubes tightly screwed in the cartridges, and these need not be fitted on until just before firing. Numerous experiments have been made at various Continental mining centers under diverse conditions with this explosive, and have uniformly resulted in a clear demonstration of the great force it exerts and of the perfect safety with which it may be used. From a tabulated statement contained in the final report of the Prussian royal commission on explosions in mines, it appears that a long series of experiments with hellhoffite were conducted in the drift of a mine, where in each case the percentage of fire damp varied. In one instance it amounted to 10 per cent, and when coal dust as fine as flour was strewed for a distance of 10 m., no flame whatever appeared. According to the same authority, liquid hellhoffite is 70 per cent more powerful than guhr-dynamite, and 30 per cent more than liquid nitroglycerine; and in the opinion of the imperial and royal mining department of Pribram, it has over 38 per cent more breaking power than Nobel's gelatine dynamite No. 1. The following is culled from an official report of the royal Hungarian mining department of Schemnitz:

"A rail of the narrow gauge Schemnitz line was laid free upon a grass plot, and a 100 gramme hellhoffite cartridge so placed upon the rail—totally uncovered—as to be located between flange and foot. The cartridge being fired by an electric fuse, the whole foot of the rail was torn away for a length of 15 cm., and hurled to a distance of over 50 m., the surfaces of the fragments showing initial signs of fusion. A 105 gramme dynamite cartridge, placed in the same manner upon a similar rail, exploded when fired without showing any vestige of destruction."

When we add that the products of combustion remaining after the explosion of the hellhoffite are only characterized by the smell of the burnt fuse, and are neither dangerous nor disagreeable; that the price of this explosive, including the filling of the cartridges and the packing, is less than that of dynamite; and that when used in a pit the tendency of its breaking power is rather to rift than to shatter, it is sufficiently clear that the explosive to which we now direct attention is one which will make its influence felt in the mining world.—*Industries.*

Ivy for Walls.

In order to expedite the growth of ivy, the ground, previously to planting, should be trenched two feet deep, and be enriched with decomposed farm yard manure, vegetable refuse, and the ashes of burnt rubbish of any kind. The plants should be healthy and well rooted when planted, and be watered as required in dry weather. No other evergreen climbing plant is so good for covering a wall as ivy, and the old Irish ivy (Hedera helix canariensis) is not surpassed for general usefulness. Many other ivies, however, are well worthy of attention. Hedera dentata is the largest-leaved ivy in cultivation. It has a very long leaf stalk, and its hard, leathery foliage stands out boldly and effectively. H. Rægneriana is another bold and effective kind, with magnificent, large, glossy, heart-shaped leaves. H. latifolia maculata is a handsome, marble foliaged variety of canariensis. They are both of very free growth. H. azorica, sagittæfolia, and taurica are also very useful. The last named has much divided, small, and neat, distinct leaves. There are also several other very pretty variegated sorts, such as H. aurea, argentea, and elegantissima, which do not grow quite so fast as the foregoing, but are indispensable if a collection is aimed at, and are very useful for covering buttresses and small prominent positions, the more robust growers being planted to cover the broadest spaces. The green varieties of ivy delight in rich soil, which induces rapid growth, but to the golden and other variegated sorts rich soil is detrimental, for if forced into exuberant growth they are apt to sport from their variegation.—*Garden Work.*

The Keely Motor in Court.

Another act in the Keely motor farce was opened by Judge Finletter, on April 7, 1888, in the Court of Common Pleas of Philadelphia, requiring John W. Keely to exhibit, within 30 days, to experts appointed by the court, his "motor" inventions. The examination is for a special purpose, to ascertain whether he now has departed from an invention alleged to have been assigned, in 1869, to the plaintiff in the action, Mr. Bennett C. Wilson.

The First Appropriation of Congress for the Telegraph.

From a sketch of "American Inventors of the Telegraph," with special reference to the services of Alfred Vail, in the April *Century*, profusely illustrated with portraits and diagrams, the *Railway Review* quotes as follows: This was a period of discouragement and depression for the proprietors of the telegraph, scarcely relieved by a ray of light from any source. At the time, there seemed little hope that Congress would even grant the desired appropriation. The session of 1839–40 was on the eve of the most exciting and disgraceful presidential campaign that the country had ever known, and, as in later days, the members were far too much interested in legislation which would give them some imaginary advantage over their political opponents to pay attention to measures affecting the real welfare of their constituents and of the country. In December, 1842, Morse was persuaded to make one more application to Congress. The committee on commerce again recommended an appropriation of $30,000 in aid of the enterprise. The bill passed the House by a close vote, and only after a discussion which, as reported in the *Congressional Globe*, reflects scant credit upon the patriotism, to say nothing of the intelligence, of some of the participants. In the last hour of the session, March 3, 1843, the bill passed the Senate, and was signed by the President. Morse, writing to a friend in after years, says:

"This was the turning point in the history of the telegraph. My personal funds were reduced to the fraction of a dollar; and had the passage of the bill failed from any cause, there would have been little prospect of another attempt on my part to introduce to the world any new invention."

On March 4, Morse wrote to Vail the most hopeful letter he had penned in many years:

"You will be glad to learn, doubtless, that my bill has passed the Senate without a division and without opposition, so that now the telegraphic enterprise begins to look bright. I shall want to see you in New York after my return, which will probably be the latter part of next week. I have other letters to write, so excuse the shortness of this, which, if short, is sweet at least. My kind regards to your father, mother, brothers, sisters, and wife. The whole delegation of your State, without exception, deserve the highest gratitude of us all."

On March 31 Morse tendered Vail an appointment as assistant and superintendent of the machinery department of the telegraph to be constructed between Washington and Baltimore under the government appropriation, which was at once accepted, Vail immediately entering upon his duties with characteristic energy and industry. From this time forward the condition of the work is minutely detailed in his diary, and from this we gather much information of interest in respect to the subsequent progress of the work. On April 13 he suggested to Morse the trial of two or more circuits from one battery. The experiment was successful, and the result proved to be one of the utmost importance when the telegraph system became more widely extended.

A SUBURBAN RESIDENCE.

We publish an admirably planned and picturesque design of a suburban residence, by Mr. Wm. H. Beers, architect, New York. The house has been designed to occupy a corner lot, with a frontage of one hundred feet on the main street and two hundred on the side street, giving ample room for a stable in the rear of the lot. The house has an extreme frontage of 55 feet by 65 feet in depth.

The exterior of the house on first story is finished with clapboards and trimmed with corner boards, belt courses, etc., as shown on the drawing, and over each window is placed a swinging transom glazed with stained glass. These transoms are very pretty in their interior effect, and also furnish an excellent means for ventilation, when opened, in connection with the open fireplaces in each room. The second story is carried out in the "Old English" half-timbered style, with the panels filled in with round cut shingles. On the front there is a gable extending half the width of the house, with a very effective group of windows in same. The panels in this gable are filled with shingles, carved woodwork, rope twisted in artistic designs, secured to the wood, and finished in bronze, producing an excellent effect.*

A TWENTY THOUSAND DOLLAR COUNTRY HOUSE.

Keep's Tests for Foundry Iron.

A paper has recently been communicated to the South Staffordshire Institute of Iron and Steel Works Managers by Prof. T. Turner, of Mason College, Birmingham, giving a full account of the methods of testing cast iron devised by W. J. Keep, of the Michigan Stove Company, Detroit, an abstract of which is given in *Engineering*. These tests have been adopted by a number of important American firms who have to do with the buying and selling of foundry iron, and it is sought to introduce them into this country, for the purpose of providing a uniform standard, which has already been approved by a lengthened experience in America. When the tests are carried out in their entirety, 15 lb. of metal are melted in a plumbago crucible in a firebrick furnace, driven by a blast at a pressure of 2½ oz. per square inch. Three sets of test bars are run from each melting. One bar is ½ in. square and is cast with the ends against a chill exactly 12½ in. apart. Another bar is cast with this, and is run from the same gate. It is 1 in. wide and 1-10 in. thick and is run against chills in the same way as the square bar. When the bars have been trimmed and both bars and chills have attained the same temperature, the shrinkage is measured by inserting a graduated wedge between the end of each bar and its chill. A third bar is called the fluid strip. The pattern of this is 1 in. wide, 12 in. long, and 6-100 in. in thickness. This is run from the end and is poured first. The strip rarely runs full, and its length in inches is taken as a measure of the fluidity of the metal. The fourth bar is called the crook strip. It is 12 in. long, 1 in. wide, and 86-1000 in. in thickness. On the center of one side there is a rib 412-1000 in. high, 1-5 in. wide at the base, and 1-10 in. wide at the top. The unequal shrinkage of the thin flat strip and of the taper rib causes a slight curve in the test piece. This, when measured, affords valuable information as to the properties of the iron, and is called the "crook." The first and second bars are tested for transverse strength and resistance to impact. The first test is made by a gradually applied weight, the deflection being measured at the same time. The resistance test is made by subjecting the bar to a series of blows from a 25 lb. weight until it breaks, the fall being at first ½ in., and increasing ⅛ in. at a time. An arbitrary scale has been constructed giving a value in pounds avoirdupois on an assumed value for a foot pound. After these tests have been made the depth of chill is determined, and the grain of the fracture is observed by means of a pair of lenses. The hardness of the metal is finally tested by means of Turner's machine, in which a polished surface is set under a diamond of a standard cut, and the diamond is weighted until it produces a scratch similar to a standard scratch. They are made by the Dunkirk Manufacturing Company, of Dunkirk, N. Y., and the price of the complete set is about $350. These tests have been in regular use for upward of two years at the Michigan Stove Company's works, where about 70 tons of iron are daily cast into thin stove plates.

AN American manufacturer of sugar coated pills added to the attractions of an exhibit of his product in London an ingenious piece of mechanism, which might have been intended to represent the pharmacist of the future. It was in the form of a cabinet provided with a series of knobs or buttons, each inscribed with the name of some malady for which a remedy might be asked. The customer puts a coin into a slit and presses the button calling for the remedy he requires, when immediately a drawer flies out containing the article sought. This automatic dispenser of course makes no mistakes. If the customer accidentally presses the wrong button, he alone is responsible for the error. Is this really what we are coming to?

* A description of the house, with a number of other views showing the bracketed gable, oriel bay window, and other ornamental features of the house, appeared in the June, 1887, number of the ARCHITECTS AND BUILDERS EDITION OF THE SCIENTIFIC AMERICAN, copies of which may be had at this office and of news agents. Price, 25 cents.

ENGINEERING INVENTIONS.

An electrical governor has been patented by Mr. Frank E. Prichard, of Cedar Falls, Iowa. It is designed to control the speed of water wheels and other motors by means of an electric current, a ratchet wheel being connected with the valve or gate, engaging an oscillating lever carrying pawls, in connection with electro-magnetic mechanism for controlling the pawls and a centrifugal governor for connecting the current.

A rotary excavator for removing snow has been patented by Mr. Edward Leslie, of Orangeville, Ontario, Canada. It is mounted on the forward end of a car in connection with a cylindrical casing, having a revolving wheel provided with radial fans, and outer and inner sets of knives held in front of the wheel, the invention being an improvement on a former patented invention of the same inventor.

AGRICULTURAL INVENTIONS.

A cotton planter has been patented by Mr. Jacob R. White, of Greenville, Ala. It is designed to plant cotton and other seed in rows or drills, opening the soil, dropping the seed regularly, and then covering the seed, all in one passage of the machine over the field.

A plow standard has been patented by Mr. William H. Hodgson, of Winona, Minn. This invention relates to an improved union whereby a plow standard may be connected to a beam, the parts being so arranged that the vertical angle of the beam may be adjusted as desired, a lateral adjustment of the beam being also provided for.

A combined planter and fertilizer distributer has been patented by Mr. James M. Pope, of Canton, Miss. It is adapted for planting small grain, corn, or cotton, for distributing a fertilizer, and for covering the seed and fertilizer after they have been deposited in the ground, the invention covering various novel features of construction and combinations of parts.

MISCELLANEOUS INVENTIONS.

A spindle-driving device for spinning machines, etc., has been patented by Mr. Leedham Binns, of Philadelphia, Pa. It is for driving by one band two spindles on opposite sides of a spinning or spinning and twisting frame, or on opposite sides of the drum which drives the spindles.

A waterproof paint has been patented by Mr. Matts Fred, of Hancock, Mich. It consists of charcoal, boiled linseed oil, litharge, binoxide of manganese, and other ingredients mixed and combined after a specified manner, in proportions explained for different uses.

A paper box has been patented by Mr. Albert H. Zugalia, of Brooklyn, N. Y. This invention covers a box to be cut and folded from a single piece of material, which, when folded and properly interlocked, will form a complete box, dispensing with all fastening or gluing of the parts.

A bolt has been patented by Mr. George D. Murdoch, of Brooklyn, N. Y. It is a separator for cleaning bone black, sulphur, coffee, or any dry matter required to be freed from dust, the invention covering a novel construction and combination of parts in a bolt to do such work in an expeditious, simple, and effective manner.

An instrument for dividing angles has been patented by Mr. Adolfo Saenz Yanez, of New York City. It is an instrument for dividing sectors and angles into equal parts, made of a thin plate preferably provided with a semicircle, and having a diameter pass through its center which forms the base of the instrument.

A shackle has been patented by Messrs. Leonidas C. Ferrell and David Israel, of Donaldsonville, La. It consists of a safety belt provided with a lock and with hand cuffs for holding the prisoner's hands down in front of him in an easy position, and one which will prevent him from running rapidly or offering great resistance.

A sleigh has been patented by Mr. Nelson G. Reynolds, of Bangor, Mich. It is of that class in which the runner knees are secured to the body by a connection that will permit of oscillation or tilt of the body upon the runners, or vice versa, the connection being strong, simple, cheap, and not liable to get out of order.

Combined outside and inside calipers form the subject of a patent issued to Mr. Oliver D. Warfield, of Chicopee Falls, Mass. The device has legs formed with inclined arms at one end and bowed arms at the other, semicircular threaded recesses and a pivot screw therein, a screw-threaded rod, an adjusting nut, and a spring.

A vehicle wheel has been patented by Mr. Joseph Blais, of Duluth, Minn. Caps are fitted on the outer ends of the spokes having outer sockets, and a split metallic rim fitted to run circularly in the sockets, with other novel features, designed to afford a wheel of great strength and elasticity, with convenient and effective adjustability for shrinkage.

A water trap for gas mains has been patented by Mr. Alexander Chambers, of Toledo, Ohio. It consists of an arm secured by one end to the outlet valve and carrying a float on its other end, a lever fulcrumed in the float chamber carrying a float, with means for locking the valve arm until the water nearly fills the casing and raises the lever and its float.

A composition for lining vessels has been patented by Mr. James A. Blanchard, of Brooklyn, N. Y. It is to fit such vessels for use in inclosing compounds of a corrosive nature, either in a solid, fluid, or semi-fluid state, and is made of resin, pitch, and other ingredients, compounded and applied in a specially described manner.

A calf weaner has been patented by Messrs. Henry W. and Walter Fuller, of Seneca, Kansas. It consists of a detachable nose piece having side and front spikes, and a lattice work frame with side and bottom and upwardly projecting spikes, formed in two portions projecting downward and diverging and pivoted to the nose piece.

A snap hook has been patented by Messrs. Edwin Crippen and William King, of New Orleans, La. The body of the hook is reduced at its lower end and curved to form an open hook, over the entrance to which a spring is held in the usual manner, the upper part of the body being formed with apertured cheek pieces for attaching the shackles to the hook.

A hand propelling device for sewing machines has been patented by Kate P. Beaird, of Tyler, Texas. A rod is jointed to the fly wheel after the manner of a pitman, and is fashioned into a handle extending obliquely up toward the operator, being combined with and held in place by a guide frame which may be attached to the framework of the machine.

A corner iron for carriage bodies, seats, etc., has been patented by Mr. Joseph Doty, of Wellsville, N. Y. Its body has longitudinal side mortises, with spaced partitions at the lower end and an apertured cap, whereby two or more boards required to meet at an angle may be firmly attached to form a corner, either round, square, oblique, or angular.

A gate has been patented by Mr. George Ford, of New Harmony, Ind. The gate is made of two sections, arranged between two latch posts, and is pivoted centrally so that any resisting action of the wind on one side of the pivot will be counteracted, and the gate may be turned as freely in windy as in other weather, with various other novel features.

A sash balance has been patented by Mr. Thomas Jones, of Danville, Pa. Combined with a rack adapted to be secured to the window sash is a frame for insertion in the window frame, having a spring-actuated pinion and angle lever with arm engaging the pinion, and other novel features, the main object being to dispense with weighted sash lines and the ordinary sash fastener.

A tire-upsetting machine has been patented by Mr. Robert Rutter, of Butte City, Montana Ter. The heads or seats for the tire are formed with standards and bosses projecting therefrom, in connection with gripping cams recessed to receive the bosses, the construction relieving the strain on the pins that connect the gripping cams to the stationary and sliding heads.

A cash carrier has been patented by Mr. Louis J. Bishop, of Cleveland, Ohio. Combined with a track wire and cash carrier mounted thereon are friction rollers, with carved-face propelling arms fulcrumed to operate in opposite directions on the friction rollers with a wiper-cam action, a spring clasp holding the carrier at the end of its route, and forming an elastic buffer to receive its impact.

A balance apparatus for ascertaining counts or numbers of yarn has been patented by Mr. Emil Staub, of Leipsic, Saxony, Germany. The counts or numberings are reduced to a single weight, which is fixed at one end of a balance arm, at the other end of which is a hook, a pattern or templet being prepared for each system of numbering according to which the samples have to be cut.

An ice creeper has been patented by Messrs. William W. and Edward F. Preston, of Bismarck, Mich. It is designed to be applied to rubber overshoes, and has a shank or main plate, a turnover pivoted or lever spur frame, and a spring controlling the latter, making a reversible ice creeper, for adjustment beneath the heel, or which may be folded up within the shank of the sole.

The manufacture of buttons forms the subject of a patent issued to Mr. Daniel A. Ladd, of Newark, N. J. It is a method consisting in first forming a shank and an approximately spherical hollow and apertured body, inserting the end of the shank and finally compressing the body to the form of the head of a button, the improvement being especially applicable in the manufacture of collar buttons.

A roller for producing alto-rilievo ornamentation has been patented by Mr. John H. Thaison, of Chicago, Ill. It is made with a rim on the face of which are produced sunken or intaglio patterns, the rim being cut away to conform to the outer margins of the patterns, and also cut through to conform to inside openings, for producing ornamentation in plastic composition applied to picture frame mouldings, etc.

A baling press has been patented by Mr. Andreas Mattijetz, of Giddings, Texas. It has a slotted baling box and plunger held to slide therein, arms rigidly connected with the plunger and having racks on their under sides, a shaft with pinions meshing with the racks, with other novel features, making a simple and durable press which may be operated by hand or power.

A method of preserving submerged timbers has been patented by Mr. Hiram L. Ricks, of Eureka, Cal. The invention consists in forming in the piles or timbers longitudinal or transverse passages, or both, and connecting the piles or timbers by pipes which communicate with a tank containing fresh water, which by pressing outwardly displaces the salt water and keeps the timbers constantly soaked with fresh water.

A galvanic battery forms the subject of two patents issued to Mr. Horatio J. Brewer, of New York City. The jar, by one of the patents, has its mouth formed by an outwardly extending flange, the electrodes being held together by elastic bands, of which the upper one rests on the flange of the jar, thus supporting the electrodes in the jar and also forming a tight joint to prevent the spilling of the exciting liquid. By the other invention, the porous cup itself forms the cover for the jar, at the same time permitting the insertion of the zinc rod, which is prevented from coming in contact with the electro-negative sediment in the bottom of the jar.

NEW BOOKS AND PUBLICATIONS.

PRACTICAL HINTS FOR DRAUGHTSMEN. By Charles W. MacCord, A.M., Sc.D., Professor of Mechanical Drawing in the Stevens Institute of Technology, Hoboken, N. J. John Wiley & Sons, N. Y., publishers.

The practical draughtsman should be master of the principles of projection, and in the main these principles should be religiously adhered to in mechanical drawings, but there are times when this is impracticable, and when these rules should be abandoned. The pages of the present volume show how and when this should be done, and how, aided by judgment and ingenuity, such liberties may be taken. This subject is illustrated by a number of detail drawings. These will be found of value to the student and workman. There is also a section on free hand sketching, and a number of chapters on the selection and use of drawing instruments. Bound in cloth. 4to, 100 pages. Price $2.50.

A TREATISE ON ELECTRICITY AND MAGNETISM. By E. Mascart and J. Joubert. Translated by E. Atkinson. Vol. II. Methods of Measurement and Application. London: Thomas De la Rue & Co. 1888. Pp. 792. Price $5.00.

The second volume of this work treats in the fullest manner of the mathematics of electrical measurements. The formulæ are given in the fullest detail, and the eminence of Professor Atkinson's name as translator adds to the standard quality due to Professors Joubert and Mascart. The illustrations are all thoroughly pertinent, and are of the plainer and more useful type whose use now prevails in electrical books. A copious index of references to both volumes is given. Numerous tables of electrical constants are included in the text.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

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(1) L. C. asks: Would the carbon, made as described in SCIENTIFIC AMERICAN of April 23, 1887, page 266, question 2, do to run the motor described in No. 11, current volume? A. Yes. 2. If so, how large should the carbon be for one large cell, sufficient to give the motor one man power, using the following mixture, which I copy from the *Electrical Review:* "Dissolve common soap in boiling water, and add to it small quantities of bran and caustic potash or soda. The mixture forms in the manner of jelly, and will not readily spill." I wish to attach the motor to a vehicle and any liquid will easily spill. A. The motor is not adapted to a single large battery. As we have never seen a practical trial of the soap and caustic potash battery, we are unable to say anything as to its merits. 3. Is it best to have one large cell or a number of smaller ones? If it is best to have small cells, how many half gallon or quart cells will be required to run the motor? A. It will require about 8 cells of plunging bichromate battery, with zincs and carbons 5 x 7 inches.

(2) P. J. N. writes: Will you please inform me what form, whether round, square, or twisted, is best for lightning rods? Also, what material is best? Would it be well to join all the bottoms of the rods, say 4 or 6 rods, to the galvanized two inch pipe of a drive pump, forty feet deep in earth? A. The form of lightning rod is immaterial. Copper is thought to be best. Iron rods of double the diameter of copper have the same capacity. The drive well would form a very good ground, but the surface is rather small. We would advise the use of several grounds consisting of plates of copper buried in moist earth, or of beds of coke having the ends of the rods looped and laid back and forth upon the coke bed, with a covering of coke above the rods. The coke should, of course, be in contact with earth that is always moist.

(3) S. W. C. writes: 1. Are there not some discrepancies in the description of the simple electro motor described in your issue of March 24? For the armature you say to use 12 coils of No. 16 wire, four layers in each coil, and eight convolutions in each layer. This would require 96 convolutions of wire in the circumference of the armature, and as No. 16 insulated wire measures 0·066 (over the insulation), there would have to be about 6⅓ inches in which to wind the 12 coils. Now, the inside of the armature, when wound, would be only 1¼ inches diameter, or about 3⅛ inches in circumference, and therefore could not contain the required number of convolutions. A. Armature may be filled with No. 16 single covered magnet wire, if carefully used, but it is difficult to wind the armature with wire of this size in such way as to get the wire all in. The resistance of the armature is increased somewhat by using finer wire, but owing to the facility with which No. 18 can be wound, it is, perhaps, advisable to use that size instead of No. 16. 2. It is stated that each coil requires about 30 feet of wire. As there are 32 convolutions, and only about 6 inches in each convolution, I do not see how there could be more than about 16 feet. A. There was an error in giving the length of this wire. The length is about 15 or 16 feet.

(4) H. R. S. writes: In winding the armature, I am using double covered No. 16 wire, and after winding six coils as described, I find that I shall not have room on the armature to wind the other six coils with eight convolutions. Would the motor run all right if eleven instead of twelve coils are used, or would it be better to wind the remaining six coils with seven convolutions? I saw in the last issue of your paper that if the coils were wound with unequal lengths of wire, that the motion would be irregular. To what extent would be the irregularity of motion, in either of the above cases? Is there any other way than that I have stated, besides rewinding, of overcoming my difficulty? In case I should wind the remaining coils with seven convolutions, should I decrease the amount of wire on the field magnets? In running a sewing machine or lathe, what inconvenience would the irregularity of the motor cause? Would the irregularity be enough to be noticeable in the lathe? A. By using single covered wire you will be able to get in the required number of coils. There will be no particular objection to using No. 18 instead of No. 16, if you find your ring too small to receive the No. 16. Slight irregularities of winding, such as you mention, would not have a very serious effect upon the operation of the motor. There will be no observable irregularity in the rotation.

(5) Montana wishes to know if there is any limit to the height a siphon will work, provided you can get the water started. A. Theoretically, the limit of the action of a siphon is 33 feet high, but practically, only about 26 feet is realized.

(6) G. I. H. asks (1) if the field magnet of the electric motor described in March 17 number of SCIENTIFIC AMERICAN is to be of one piece of Russia iron, or of different pieces, and if of one piece, where can it be obtained? A. It is unnecessary to make the field magnet of a single piece of Russia iron. The strips should be as long as you can conveniently procure. The ends of the strips may be simply abutted. 2. Is any of the wire to be cotton covered, except for winding the armature? A. All of the copper wire used in the construction of the machine must be insulated. Single covered magnet wire will answer.

(7) H. C. S. writes: I am trying to make a motor like one described in No. 11 of SCIENTIFIC AMERICAN. I find that I cannot wind twelve sections, eight wires wide and four deep, of 16 cotton covered wire. In Mr. Hopkins' directions he says it takes only 30 feet of wire on each section of the armature. What is the cause of the trouble? I find it takes only 16 feet to the section. A. Your inability to wind on the required number of convolutions and layers of wire in the sections of the armature is probably due to one of two causes, or perhaps both. You may have used double or triple covered wire. The wire in the armature illustrated is No. 16 single covered magnet wire. You may have failed to lay the wire straight and truly parallel. The way out of the difficulty is to omit one convolution from each of the last two layers of wire in each coil, or wind the armature with No. 18 wire. The latter plan is preferable. You are right in regard to the length of wire in each coil of the armature. It was erroneously given as 30 feet. It should have read 15 to 16 feet.

(8) S. J. A. writes: I have wound my field magnet with wire which I bought of the Detroit Electrical Works for No. 16 insulated. Now I find after one coil is on the armature ring, I cannot get the second in its proper place, the first being too wide. I used four layers, 8 wires wide. What shall I do? Use smaller wire or a less number of convolutions? I have my field magnet all wound, and don't know what to do. A. See answer to H. C. S.

(9) R. M. S. writes: I am making an electric motor as described in SCIENTIFIC AMERICAN issued March 17. In the bill of dimensions and quantities, I find I cannot get 30 ft. in each coil on the core. It is specified 4 layers in each coil, and 8 convolutions in each layer. What I wish to know is, is the effectiveness of the motor governed by the proportional amount of wires in armature to the field magnets? If so, does lengthening or shortening the wires in the coils make the motor stronger? I find by actual trial that 15 ft. will fill each coil, thus shortening just one-half. A. See answer to H. C. S.

(10) W. C. F. asks: 1. Would it be well to use a motor run by batteries to run a dynamo to produce light? A. The use of a motor run by batteries to operate a dynamo to produce a light is very much like pumping water by hand to operate a water wheel to run a grist mill. Better use the current from your battery to operate your lights, as you will lose more than half of it in the process you describe. 2. Would the motor of SCIENTIFIC AMERICAN, March 17, 1888, run the small dynamo of SCIENTIFIC AMERICAN SUPPLEMENT, No. 161? If not, how could the dynamo be changed? A. The motor referred to would not run the dynamo to any advantage. The dynamo could not be changed so as to be run advantageously by means of the motor.

(11) B. F. S. writes: I was much interested in an article headed "Simple Electric Motor," in SCIENTIFIC AMERICAN of March 17, 1888, and have begun the construction of one. The battery is the point I am in doubt about. The article says, eight cells of plunging bichromate battery, each having one zinc plate 5 x 7 inches, and two carbon plates of same size, will develop enough power, and run an ordinary foot lathe or two or three sewing machines. Does this mean Fuller's mercury bichromate battery or the Grenet battery? Can you refer me to any number of your paper in which I can get a description from which to construct, at moderate cost, a suitable battery to run this motor? A. The battery is of the Grenet type. We have not described a battery of exactly this construction, but expect to do so at an early day.

(12) G. M. C. asks: I want a cement that will bind (1) a strip of rubber, (2) a strip of rough dressed leather to a strip of steel same size, about 14 inches long, and in other dimensions about like the whalebone that goes in a corset. The cement to be firm enough to hold, despite active and frequent motion like that employed in laying on the rod. A. Use a cement composed of equal parts of pitch and gutta percha, with the addition of a very small percentage of some fixed oil—lard oil for example.

(13) W. D. L. asks: 1. Would you please inform me if the small "Electric Motor" described in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 641, would require an electric current of a strength which would make it dangerous in the hands of an inexperienced person? If not, why? A. The current required for the motor is not at all dangerous. 2. Also would the prepared hektograph ink to be had in stationery stores give the same result as that of the formula for use on the copying pad described in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 436? A. The prepared ink will answer the purpose.

(14) H. S. P. writes: 1. I have a one horse power engine in our coffee roasting department. Can I use the small electric motor recently described in the SCIENTIFIC AMERICAN as a dynamo, by connecting it to line shaft and driving it with the engine? Could I develop enough electricity to make one or more small incandescent lights? A. By using a cast iron field magnet and winding the armature with finer wire you will be able to produce a current that will run one or two small lamps. 2. Can I procure a number of your paper in which there is given a description and illustration of a plunging bichromate battery? A. We shall at an early day publish a description of a plunging battery.

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April 10, 1888,

AND EACH BEARING THAT DATE.

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Potato digger, A. B. Shantz 380,771
Press. See Baling press. Hay press.
Pressure indicator, electrical, O. B. Shallenberger 380,944
Propeller, feathering, R. Wilcox 380,967
Propelling canal boats, H. H. Baker 380,781
Protector. See Boot protector. Watch protector.
Pulleys, clutch for band, W. H. Smith 380,952
Pumping apparatus, horse power, H. D. White 380,840
Rack. See Advertising rack.
Railway crossing, J. Cumming 381,086
Railway frog, I. A. Perry 380,931
Railway grip, cable, A. E. Roe 381,032
Railway signal, W. B. Sherman 381,096
Railway switch, W. S. Arnold 380,972
Railway tie, metallic, W. H. Donaldson 381,089
Railways, contact making device for electric, F. Wynne 381,040
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Register. See Cash register.
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Rein holder, E. E. Brewster 380,676
Rice rake, cotton chopper, and cultivator, J. A. Gardner 380,885
Rivet extractor, F. Snitzel 380,703
Roads, machine for making, repairing, and clearing, G. W. Taft 380,954
Rocker spring, G. H. Hebbard 380,891
Roller mill, F. Ferrier 380,978
Rolling machine, metal, D. E. Kempster 380,759
Roofing felt, manufacture of, H. M. Miner 380,915
Roofing, tile, A. W. Cooper 380,864
Rotary liquid meter, W. E. Pearson 380,784
Rudders, apparatus for controlling ship's, T. G. Stevens 381,035
Sad iron, Gilmore & Stafford 381,008
Safe, burglar-proof, M. S. Goldsmith 380,717
Safety pin, J. Jenkins 380,896
Safety switch, St. Cyr & McDonald 381,084
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Sash cord fastener, J. H. Jones 381,018
Saw guide, G. F. Striegel 380,928
Sawmill dog, J. H. Miner 380,916
Saw swage, S. Hill 380,758
Saw tooth, E. Harris 381,011
Saws, machine for straightening and hammering, M. Cuvel 380,989
Sawing machine, band, C. Bryant 380,857
Scale, automatic weighing and recording, E. H. Amet 380,672
Scale beam, A. H. Smith 381,097
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Screw cutting die, F. L. Maule 380,908
Sealing fruit jars, device for, W. W. Osmond 380,923
Secondary battery, H. H. Carpenter 380,980
Seed hulling machines, cylinder for cotton, A. D. Catlin 380,797
Separator, A. Wempia 380,959
Sewing bags, machine for, L. Bollmann 380,981
Sewing comfortables and other fabrics, machine for, F. L. Palmer 380,915
Sewing machine presser foot, D. A. Sutherland 381,090
Sewing machines, hand propelling device for, K. P. Beaird 380,973
Shackle, Ferrell & Israel 381,005
Shafts and pole for vehicles, convertible, W. H. Kelly 380,890
Sheaf carrier, L. B. Willey 380,908
Shelf, revolving, C. Jewell 380,897
Sheller. See Corn sheller.
Shoe upper turning machine, F. D. Walden 380,959
Show case for entomological and other specimens, C. F. McGlashan 380,702
Shutter, J. T. Miller 380,914
Shutter fastener, J. A. Bachman 380,738
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Sled, child's, Pratt & Chase 380,694
Sleigh, N. G. Reynolds 380,819
Snap hook, Crippen & King 380,997
Snap hook, J. L. Martin 380,697
Snow, rotary excavator for removing, E. Loulis 380,909
Soda water dispensing apparatus, O. J. Price 381,027
Sodium, etc., apparatus for obtaining, O. M. Thowless 380,776
Sodium, etc., obtaining, O. M. Thowless 380,775
Speculum, P. Chamberlin 380,745
Speed governor for motors, E. B. Benham 380,848
Speed indicator, electrical, F. W. Schiepegrell 380,824
Spinning machines, etc., spindle driving device for, L. Binns 380,784
Spinning mule, W. Hackaley 381,009
Spoon, medicine, C. Langguth 380,734
Spring. See Bed spring. Rocker spring.
Square, bevel, and clinometer, combined center, T and try, H. W. Evans 380,714
Steam engine, W. F. Class 380,901
Steam engine, E. S. Smith 380,955
Steam engine indicator attachment, J. B. Mitchell 380,918
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Steam washer, J. M. Reddy 380,729
Stone, artificial, O. A. Tanner 380,830
Stopper. See Bottle stopper.
Stove, gas, Smith & Boyd 380,732
Stove, heating, J. A. Price 381,028
Stove, heating, Walker & Wilbur 381,006
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Strainer, conductor, P. Drendul 380,873
Surface gauge, H. C. Baisbaugh 380,740
Surgical knife, W. Schott 380,698
Swinging gate, H. Sipe 380,772
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Switch and signal, interlocking, J. J. Turner 381,088
Syringe, C. M. Barton 380,673
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Tapping steam, gas, or water fittings, machine for, A. M. Burritt 381,053
Target and indicating device therefor, T. B. Ralston 381,038
Telegraph apparatus, municipal, J. C. Wilson 380,778
Telegraph, municipal, J. C. Wilson 380,779
Telephone and signaling circuit, J. C. Wilson 380,780
Telephone, electrical, F. D. Marston 380,905
Telephone transmitter, I. H. Farnham 380,759
Tenons, forming compressed spoke, W. F. Morton 380,726
Tenons, machine for compressing, W. F. Morton 380,727
Thermometer, recording, D. Draper 380,872
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Timbers, preserving submerged, H. L. Ricks 380,820
Tire upsetting machine, R. Rutter 381,095
Toboggan, Emerson & Wetmore 380,875
Toothpick, R. A. Bacon 380,730
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Track clearer, J. B. Hoagland 381,072
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Tricycle, H. W. Schiermeyer 380,770
Trousers, apparatus for pressing, Whitaker & Williams 380,905
Trucks, center bearing for car, G. W. Dithridge 380,770
Truss, L. B. Stuart 381,089
Tube cutter, J. R. Vance 380,777
Tug, hame, C. A. Kupfer 380,903
Type writing machine, A. P. Eggis 380,782
Umbrella hanger, J. A. Crandall 380,906
Umbrella runner retainer, J. Rose 380,935
Upsetting machine, Cooke & Carlough 380,862
Valve, check, L. Schutte 380,940
Valve for multiple cylinder engines, E. B. Benham 380,849
Valve gear, releasing, C. A. Dixon 381,001
Valve, steam-actuated, Fogarty & Wheeler 380,802
Valve, steam-actuated, W. W. Hanscom 380,898
Valve, stop, J. A. Creelman 381,055
Valves and other mechanisms, device for operating, L. Schutte 380,941
Valves, cut-off mechanism for slide, Tangye & Johnson, Jr 380,955
Vat. See Tan vat.
Vehicle, passenger, R. A. Morse 380,812
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Vessels, composition for lining, J. A. Blanchard 380,853
Vise, W. L. Tobey 380,734
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Wagon panel fastener, H. Hett 380,710
Walls of buildings, sheet metal siding for covering the, J. B. Determann 381,090
Washer. See Steam washer.
Washing machine, J. M. Boughton 380,675
Washing machine, J. R. Elliott 381,004
Washing machine, J. Killefer 380,902
Washing machine, H. Nadermann 380,914
Washing machine, F. Schumpe 380,930
Watch balance, P. W. Rohde 380,769
Watch protector, J. Debrinke 380,860
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Water motors, rotary nozzle head for, E. S. Piper 380,601
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